

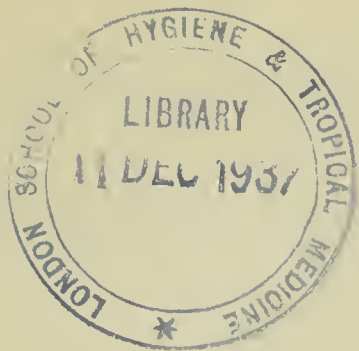
REPORT

OF THE

SUDAN MEDICAL SERVICE

FOR THE YEAR

1936



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ANNUAL REPORT 1936.

SUDAN MEDICAL SERVICE.

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ANNUAL REPORT

OF THE SUDAN MEDICAL SERVICE

FOR THE YEAR 1936.

GENERAL HEALTH.

The public health of the Sudan was adversely affected by the epidemic of cerebrospinal meningitis which continued from the previous year, and spread to every province in the northern and western Sudan. Owing to late, heavy, badly spaced rains, and an irregular drop in the river at the same time, the incidence of malaria was higher than usual in the northern Sudan in September and October.

HEALTH OF OFFICIALS.

Nationality	Number of Officials employ- ed	Total		Average days' sickness		D i e d	Invalided
		Placed on sick list	No. of days' sickness	For all offic- ials	For those who were sick		
British	820	184	1278	1.56	6.94	2	2
Sudanese	3836	760	5704	1.48	7.50	14	4
Egyptians	537	132	890	1.66	6.74	4	2
Syrians	49	2	8	0.16	4.00	-	-

The comparative figures for the past five years are as follows :—

				1932	1933	1934	1935	1936
British.								
Days' Sickness	...	...	...	2.05	1.26	1.33	1.32	1.56
Died	...	...	...	5	2	2	1	2
Invalided	...	...	...	5	4	2	3	2
Sudanese.								
Days' Sickness	...	...	...	1.75	1.65	1.56	1.42	1.48
Died	...	...	...	5	10	8	5	14
Invalided	...	...	...	5	6	7	13	4
Egyptians.								
Days' Sickness	...	...	...	0.84	1.21	1.09	1.17	1.66
Died	...	...	...	1	4	3	3	4
Invalided	...	...	...	2	1	—	1	2
Syrians.								
Days' Sickness	...	...	...	0.80	0.80	2.43	0.22	0.16
Died	...	...	...	1	—	—	—	—
Invalided	...	...	...	2	—	—	—	—

Assuming that a British official works for nine complete months in the year, the total number of days lost by sickness in 1936 is equivalent to the loss of 4.6 officials, and compares with previous years as follows :—

1931	...	...	...	...	8.5	1934	...	...	...	...	3.8
1932	...	...	...	...	5.9	1935	...	...	...	...	3.9
1933	...	...	...	...	3.6	1936	...	...	...	...	4.6

The following table shows the number of days lost by officials in various provinces over a period of five years :—

		Northern Province					Blue Nile						Equatorial Province	
		Halfa	Dongola	Berber			Kassala	Port Sudan					Blue Nile	Fung	Mongalla	Bahr el Ghazal
British.														
1932	...	—	0.4	0.6	0.8	0.7	2.0	6.0	0.4	3.0	0.8	3.0	3.1	2.5
1933	...	0.6	3.4	1.0	1.5	0.9	2.3	3.5	2.5	2.5	0.9	1.3	3.8	3.0
1934	...	1.4	0.6	0.3	1.3	0.9	1.2	2.6	5.2	0.7	1.8	2.4	3.3	2.0
1935	...	—	1.9	0.3	0.7	0.3	1.5	2.7	1.8	1.3	1.0	4.4	2.0	4.3
1936	...		0.7		1.4	1.7	1.9		1.2	2.4	1.3	2.6	2.2	
Sudanese.														
1932	...	0.6	2.2	0.4	1.3	0.4	2.1	1.2	1.2	1.6	2.2	1.7	2.5	1.5
1933	...	1.4	1.4	0.7	1.2	0.3	1.6	3.6	2.4	3.1	1.3	3.8	2.8	3.0
1934	...	1.6	1.1	0.6	1.8	0.9	1.2	1.6	1.7	2.4	3.8	6.6	4.0	2.1
1935	...	1.0	1.0	1.0	1.2	1.1	1.4	3.1	1.7	1.1	1.9	5.5	2.8	4.1
1936	...		0.5		1.7	1.5	1.4		1.4	2.6	0.5	1.5	5.7	
Egyptians.														
1932	...	1.0	—	0.6	0.2	1.1	1.2	0.2	0.8	0.3	—	1.8	1.0	1.5
1933	...	0.6	—	0.9	0.9	1.8	1.9	1.8	1.3	1.5	—	3.6	2.0	0.6
1934	...	—	—	0.6	1.3	0.2	0.4	3.3	—	1.1	1.8	6.0	3.5	2.4
1935	...	1.0	1.0	0.5	1.9	0.1	1.0	0.5	4.3	1.8	3.0	5.2	0.7	5.0
1936	...		0.6		0.5	1.2	0.8		3.1	3.1	0.8	2.6	9.7	

The numbers concerned are too small to enable accurate deductions to be made.

EPIDEMIC DISEASES.

CEREBROSPINAL MENINGITIS.

13,440 cases with 8,906 deaths were reported. They were distributed as follows :—

PROVINCE.	Cases.	Deaths.
Blue Nile	1,433	916
Equatorial	1	1
Darfur	8,833	6,158
Kassala	67	41
Khartoum	360	251
Kordofan	2,293	1,386
Northern	220	130
Port Sudan and Suakin	3	2
Upper Nile	14	7
White Nile	216	14
	13,440	8,906

The incidence for the last seven years is as follows :—

Year.	Cases.	Deaths.	Year.	Cases.	Deaths.
1930	865	665	1934	4231	3341
1931	348	240	1935	3249	2154
1932	532	384	1936	13440	8906
1933	166	131			

The disease was raging in parts of Kordofan Province, and had been reported in Darfur Province at the end of last year. Despite every effort to localize the epidemic, it spread to all parts of these provinces during the first six months of the year, and also to the Northern, Khartoum, White Nile, Blue Nile, and Kassala Provinces.

The only effective prophylactic measure under field conditions was found to be the evacuation of villages to specially constructed shelters in the open country. Where possible a separate shelter was constructed for each person. Thanks to the tireless efforts of the administrative and medical staff, and the native administration officials, and the ready cooperation of the people themselves, it was found possible to carry out this measure effectively over extensive areas with a large population. The result was sufficiently obvious to impress the inhabitants themselves, and there is no doubt that many thousands of lives were saved, but it is a sad reflection on modern medical science that it was impossible to prevent the heavy loss of life which occurred. Treatment under field conditions is unsatisfactory, although serum may be of use in early cases where hospital facilities are available.

As usual in the Sudan, the epidemic died down with the onset of the rainy season.

Darfur Province.

An epidemic broke out during the 1935 harvest, and killed 7000 of the inhabitants before it subsided in the spring of 1936.

The total number of known cases was 9920 and the mortality 69.8%.

Of these 8833 cases with 6158 deaths occurred in 1936.

Previous to 1935, Darfur had been free from the disease since the occupation in 1916. The inhabitants remember an epidemic, even more extensive, previous to this date. The usual precautions were taken. The greater part of the population of Darfur were made to abandon their villages and live under shelters in the open.

Control of movement was impracticable but the sick were isolated and an attempt made to segregate contacts.

The agricultural tribes of the west suffered much more heavily than the others, and those along the western frontier most heavily of all.

Nomad tribes suffered least, semi-nomadic tribes less than dwellers in permanent villages.

It would seem certain that overcrowding is the main factor in spreading the disease locally and therefore prolific tribes living in villages suffer more than others, partly due to overcrowding, partly to the relatively high proportion of children.

Possibly the rapid transmission of the disease from person to person increases its virulence.

The abandonment of villages and occupation of shelters diminished the spread of the disease, and this measure was found to be more effective if every child was given its individual shelter and made to occupy it.

The usual precautions taken to protect school boys and prisoners appeared to be effective.

Experiments with Essogen were inconclusive.

Kordofan Province.

Dr. A. P. Farmer, Acting Senior Medical Inspector Kordofan Province reports as follows:—

Cerebrospinal meningitis. The epidemic which raged during the first six months of the year started in November 1935 when the first cases were reported near Kadugli. From there the disease spread or fresh outbreaks with obvious connection with others arose until by the time the epidemic ceased, cases had been reported from El Obeid and the central district, the whole of western Kordofan except the extreme north of Dar Hamar and the Bahr el Arab region, the whole of eastern Kordofan, northern Kordofan round Bara with a few isolated cases in the Soderi area, and practically the whole Nuba Mountains area excluding Rashad merkaz and Delami sub-merkaz.

The disease finally died away at the end of June, the last cases occurring in eastern Kordofan near Um Ruaba. The final cessation coincided with the beginning of the rains.

In December a sporadic case occurred in Nahud, and a small outbreak in the Um Ruaba area.

It is interesting to note that the disease started in communities which had been lightly attacked in the previous year, while the Rashad area which had been heavily attacked in previous years escaped entirely.

The total number of cases was 2293 with 1386 deaths giving a percentage mortality of 60.5%

The cases and deaths recorded by districts were :—

							Cases	Deaths.
El Obeid and Central District	...	...	...	...	...	...	127	117
Um Ruaba Area	...	...	...	...	...	...	314	215
Rahad Area	...	...	...	...	...	...	31	19
Bara Area	...	...	...	...	...	...	196	132
Soderi	...	...	...	...	...	...	10	4
Nahud Town	...	...	...	...	...	...	39	32
Muglad Post	...	...	...	...	...	...	14	11
Dar Hamar	...	...	...	...	...	...	397	214
Keilak	...	...	...	...	...	...	41	28
Dar Messeria	...	...	...	...	...	...	46	29
Dago Jebels	...	...	...	...	...	...	264	165
Dilling Area	...	...	...	...	...	...	227	119
Kadugli Area	...	...	...	...	...	...	466	217
Talodi Area	...	...	...	...	...	...	118	84
Heiban Area...	...	...	...	...	...	...	3	—
							2,293	1,386

The cases, deaths and percentage mortality for the last three years are :—

Year.						Cases.	Deaths.	Mortality.
1934	...	...	...	...	...	3,990	3,158	78 %
1935	...	...	...	...	...	2,999	1,980	66 %
1936	...	...	...	...	...	2,293	1,386	60.5 %

From the above it will be seen that the number of cases and the virulence of the disease has been steadily dropping each year.

The measures taken to combat the disease were :—

1. Making of quarantines. As soon as an outbreak was notified medical staff and, where possible, police were dispatched to make a quarantine of the cases and contacts and to turn the people of the infected village out of their houses into open shelters. As the people themselves are beginning to realize the value of fresh air in this disease, no great trouble was experienced in getting orders carried out.

In western Kordofan the experiment of reducing the period of quarantine for contacts from 14 to 10 days was successful, no cases occurring in contacts after they had been released.

2. General measures. Instructions were sent out to all Nazirs, Omdas, etc., warning them of the existence of the disease, giving a brief summary of the symptoms and of what measures should be taken if cases occurred before the arrival of the medical staff. This propaganda proved useful in getting early information of outbreaks.

Traffic between infected and non-infected areas was stopped as much as possible and where there was cotton to be brought, temporary sub-markets were established with the cooperation of the Agriculture Department.

All crowding together was forbidden and the holding of dances prohibited.

In the towns where it was not possible to turn all the population out into shelters, they were advised to sleep out of doors and this measure was enforced in all the prisons.

In addition, in the Nuba Mountains area, propaganda was spread, advising people to give as much meat and milk as possible to juveniles and to avoid excessive fatigue and exposure to the sun.

3. Curative. No curative measures that are possible on a large scale have yet been evolved.

In El Obeid towards the end of the epidemic a quantity of anti-meningococcal serum was obtained and a number of cases treated with it but results were not encouraging.

Repeated lumbar puncture also seemed to have little or no effect on the cases so treated compared with untreated cases.

Medication with Vitamin 'A' as a prophylactic in infected communities was tried by the Senior Medical Inspector, Nuba Area, but quarantine measures were found so effective that the results were inconclusive.

Blue Nile Province.

The disease appeared in epidemic form in January and continued until the middle of June. The peak of the outbreak occurred in April and no part of the province escaped.

The total number of reported cases was 1433 with 916 deaths.

The course of the epidemic seemed to bear some relation to temperature and humidity.

The epidemic was the severest since 1914 when an attack of greater proportion swept the province.

As usual, overcrowding and close contact were the chief predisposing causes.

It is significant that only one European contracted the disease, and that no British were attacked.

The death rate was as under —

				Total.	Deaths.	%
Treated in hospital	...	...	...	168	107	63.6
All cases	...	...	...	1,433	916	63.9

DIPHTHERIA.

63 cases were reported as follows :—

Blue Nile Province	...	...	...	...	...	...	2
Darfur Province	...	...	...	...	...	...	2
Kassala Province	...	...	...	...	...	...	11
Khartoum Province	...	...	...	...	...	...	13
Kordofan Province	...	...	...	...	...	...	1
Northern Province	...	...	...	...	...	...	34

The incidence for the last six years has been :—

1931	...	...	...	...	183	1934	...	...	...	...	34
1932	...	...	...	...	138	1935	...	...	...	...	60
1933	...	...	...	...	51	1936	...	...	...	...	63

The disease has a small focus which has persisted for some years among a sparse and scattered population near Abka and Gamai, south of Wadi Halfa. This year 12 cases occurred in Wadi Halfa itself and it was found necessary to close the girls' school for a short time.

INFLUENZA.

A mild form of this disease was epidemic in the northern Sudan during the winter.

RELAPSING FEVER.

22 cases with no deaths were reported from the Singa district of the Blue Nile Province. The disease was introduced from Abyssinia, but was dealt with effectively and rapidly by the dispensaries in the district.

SMALLPOX.

Refugees from Abyssinia introduced this disease into the southern districts of the Blue Nile Province along the frontier in August. Owing to the inaccessibility of this district during the rainy season, it was difficult to deal with the outbreak at once, and cases were still being reported at the end of the year. 501 cases were reported with 132 deaths, but as an outbreak of chickenpox occurred at the same time in the same area, the subordinate medical staff stationed in the area found a differential diagnosis difficult in many cases.

A small outbreak occurred in Kassala Province, in the hills near Derudeb. 31 cases are known to have occurred : there were no deaths. Extensive vaccination was carried out in the area.

Two cases occurred in the Suakin Quarantine camp among pilgrims from the Hedjaz. The period of quarantine was lengthened and all pilgrims re-vaccinated on arrival.

The usual mild form of smallpox was reported from Wau and Rumbek districts in the Equatorial Province. There were 43 cases with no deaths.

ENDEMIC DISEASES.

ANCYLOSTOMIASIS.

NORTHERN SUDAN.

This disease only occurs in a few isolated areas in Dongola and Wadi Halfa districts.

The measures taken to deal with it and to prevent infection of the Gezira and northern Sudan generally from Egypt have reduced the incidence to negligible proportions.

Equatorial Province.

The disease is widely distributed on the west side of the White Nile, but is extremely rare east of the river.

Wau, Kajo Kaji and Rumbek are the only districts where the disease gives rise to serious symptoms.

Elsewhere the disease is usually only discovered during routine examinations.

An attempt is being made to organise village sanitation in the endemic areas, and propaganda is carried out against the disease in schools and by chiefs' courts.

BLACKWATER FEVER.

38 cases were reported with 14 deaths.

The figures for the last six years are as follows :—

Year.	Cases.	Deaths.	Year.	Cases.	Deaths.
1931	43	20	1934	34	9
1932	66	23	1935	18	9
1933	38	12	1936	38	14

The incidence by age, sex and race was as follows:—

NATIONALITY.		Male.		Female.		0-1		1-5		5-15		15-25		25-35		35-45		45-65	
		C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.
British	...	3	1	—	—	—	—	—	—	—	—	—	—	2	1	1	—	—	—
Sudanese (Arab)...	...	23	10	1	1	—	—	—	—	1	—	6	4	8	2	8	5	1	—
Sudanese (Negroid)	...	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
Egyptians	...	1	—	1	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—
Syrians	...	1	—	1	1	—	—	—	—	1	—	—	—	—	—	—	—	1	—
Greeks	...	1	1	2	—	—	—	—	—	—	—	—	—	2	1	1	—	—	—
Italians	...	—	—	2	—	—	—	—	—	—	—	1	—	1	1	—	—	—	—
West Africans	...	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
TOTAL	...	31	12	7	2	—	—	—	—	2	—	8	4	15	5	11	5	2	—

The race incidence in relation to the 12th. parallel of north latitude was as follows :—

NATIONALITY	North of 12th. parallel		South of 12th. parallel	
	Cases.	Deaths.	Cases.	Deaths.
British	—	—	3	1
Sudanese (Arab)	17	8	7	3
Sudanese (Negroid)... ..	1	—	—	—
Egyptians	1	—	1	—
Syrians	1	—	1	—
Greeks	1	1	2	—
Italians	—	—	2	1
West Africans	1	—	—	—
TOTAL	22	9	16	5

The percentage of cases occurring south of the 12th parallel for the last five years is as follows : —

Year.	%	Year.	%
1932	59	1935	62
1933	60	1936	42
1934	59		

DRACONTIASIS.

This disease is still the cause of considerable disability in the southern Sudan and the Nuba Mountains.

In the former area special wells are being constructed to reduce the incidence.

In the Nuba Mountains the situation is more difficult owing to the existence of numerous infected pools in the hills. Propaganda is carried out by chiefs dressers as they tour the hills where they live and to which they are allotted.

PROVINCE.	Cases treated.
Darfur	204
Equatorial	3225
Kassala	1
Khartoum	1
Kordofan	82
Northern	4
Upper Nile	195
White Nile	4
TOTAL	3716

DYSENTERY.

2,564 cases were admitted to hospital of whom 2,393 were diagnosed as amoebic, and 171 as bacillary dysentery.

The incidence of this disease is slowly declining, and it is hoped that the further improvement in sanitary supervision will result in a continuation of this decline in the future.

A marked reduction in the incidence is reported from Wad Medani. Kassala shows an increase of cases owing to the unexpected influx of merchants, drivers, and workmen and increased activity across the frontier; this temporarily lowered the standard of living and public health in the town.

The following table shows the admissions to hospital from each of these two diseases given as the percentage of the total admissions for all causes for 1936 and the preceding eight years.

			1928	1929	1930	1931	1932	1933	1934	1935	1936
Amoebic Dysentery	...	...	3.40	3.02	2.68	3.28	2.51	3.25	3.00	2.83	2.49
Bacillary Dysentery	...	...	0.80	0.75	0.37	0.41	0.41	0.38	0.28	0.26	0.18
TOTAL	...	...	4.20	3.77	3.05	3.69	2.92	3.63	3.28	3.09	2.67

HYDATID DISEASE.

This disease is confined to the Taposan tribe round Kapoeta where ten cases were reported in 1936 compared with 8 in 1935 and 24 in 1934.

KALA-AZAR.

214 cases were reported compared with 171 in 1935 and 289 in 1934.

The incidence of this disease remains fairly constant, and it is unlikely that there is really much change from year to year, as the disease is mildly endemic in an extensive belt of country, some 1000 miles long, parallel to and adjoining the Abyssinian and Eritrean frontiers.

Recent investigations by Sir Robert Archibald and Dr. Henderson have resulted in a keen search by the medical staff in the areas affected, and it is surprising that there has not been a larger increase in reported cases as a result.

BLUE NILE PROVINCE.

111 cases were reported, compared with 73 in 1935.

The following have been treated in hospital:—

DISTRICT	ADULTS.		CHILDREN.	
	Male.	Female.	Male.	Female.
Blue Nile	12	2	2	—
Fung and Sennar	62	9	16	8
TOTAL	74	11	18	8

The percentage mortality which was last year shewn as 40% is now reported at 20%.

Many cases appear to be resistant to both tartar emetic and neostibosan treatment.

EQUATORIAL PROVINCE.

The endemic area is the Taposan country where 52 cases were diagnosed compared with 49 in 1935. This is largely due to the keen efforts of the medical officer in finding cases as a result of a visit of Sir Robert Archibald in May to investigate the disease.

KASSALA PROVINCE.

Eight cases were diagnosed in Kassala district compared with 18 in 1935, and 13 in Gedaref in both years.

DISTRIBUTION.

The following list shews the number of cases occurring in the separate endemic areas, as male, female and children under 15 :—

PROVINCE.	DISTRICT.	ADULTS.		CHILDREN.		Total.
		Male.	Female.	Male.	Female.	
Darfur	El Fasher	2	—	—	—	2
Equatorial ...	Kapoeta	19	3	24	6	52
Blue Nile ...	Fung	62	9	16	8	95
	Gezira	12	2	2	—	16
Kassala ...	Kassala	8	—	—	—	8
	Gedaref	13	—	—	—	13
Khartoum ...	Khartoum	5	—	—	—	5
	Omdurman	7	—	—	—	7
Kordofan ...	Nahud	1	1	—	—	2
Northern ...	—	—	—	—	—	—
Port Sudan ...	Port Sudan	1	—	—	—	1
Upper Nile ...	Malakal	2	—	—	—	2
	Melut	5	—	3	2	10
White Nile ...	Dueim	—	1	—	—	1
TOTAL ...	... ..	137	16	45	16	214

Nationalities.

The nationalities affected were :—

Sudanese (Arab)	106
Sudanese (Negroid)	91
Abyssinians	5
Eritreans	2
Somalis	1
West Africans	8
Yemeni	1
	<hr/> 214 <hr/>

LEPROSY.

At the end of the year 2550 lepers were in camps or settlements, and 889 were under observation and treatment. The distribution of leprosy in the Sudan is estimated as follows :—

PROVINCE.	In camps or settlements		Under observation and treatment as hospital outpatients	Total under treatment	Under observation	Estimated No. of further cases	Estimated total number of cases
	Segregated	Under treatment but not segregated					
Blue Nile ...	—	49	7	56	6	—	62
Darfur ...	—	45	4	49	—	250	299
Equatorial ...	304	2069	—	2373	5160	400	7933
Kassala ...	—	24	1	25	—	—	25
Khartoum ...	—	—	27	27	—	—	27
Kordofan ...	—	59	758	817	—	1150	1967
Northern ...	—	—	38	38	20	—	58
White Nile... ..	—	—	19	19	—	—	19
Upper Nile... ..	—	—	35	35	—	70	105
	304	2246	889	3439	5186	1870	10495

Three new leper settlements have been opened during the year in the Nuba Mountains, and it is hoped to increase the number next year to cover the whole area.

The system of home isolation at present carried out in the northern Sudan works well. The patients are happier and consequently fitter than in colonies or settlements, and the disease appears to be adequately held in check in the provinces concerned.

In the central Sudan where the incidence is higher, settlements have been formed near dispensaries, and this method has worked well on the whole in Darfur, Kordofan and the southern part of Blue Nile Province. This system is being introduced on a large scale in the Nuba Mountains districts where it is intended that a large proportion of infectious lepers will be kept under observation and treatment. It is considered useless from a public health point of view to attempt to control the disease unless a large proportion of the infectious cases can be dealt with. Each settlement will have its own well, garden, and cows, and it is hoped to improve the diet of the inmates considerably by providing fresh vegetables, fruit and milk.

As regards the southern districts of the Equatorial Province, which is the only area where leprosy is a menace, the big settlements at Li Rangu and Source Yubo, and the smaller ones at Wau, Rumbek, Yei, Kajo-Kaji and Opari function as satisfactorily as can be expected. Unfortunately, although it was found possible to discharge 35 % of cases during the first four years, a residue now remains, the majority of whom are chronic. They live a normal village life as far as possible, and are not always anxious to be discharged. In fact at Li Rangu and Source Yubo, discharged lepers usually settle as near the settlement as possible.

Leprosy appears to be well under control throughout the Sudan, but can only be permanently eradicated by raising the standard of living and diet, particularly in the Zande country. Economic development should assist in this respect.

EQUATORIAL PROVINCE.

The settlements in the eastern part of the province contain many advanced infectious cases who are unable to grow sufficient food for themselves. In addition to the issue of meat and grain, small herds of goats are being introduced to provide milk, and, up to date, are doing well.

	Remaining 1.1.1936.	Admitted	Discharged	Died 191 17	Remaining 1.1.1937.
Yei	168	4	45	191	110
Opari	106	9	79	10	26
Loa (1.6.36)...	—	—	—	—	34
Kajo Kaji ...	104	2	51	5	50
Tolliang (Pini)	—	—	—	—	—
Koggi	35	1	3	2	31
Rumbek	36	27	17	7	39
				TOTAL	290

Yambio District. Dr. Woodman, Senior Medical Inspector, Li Rangu reports as follows :—

There are 3648 lepers known in the Yambio sub-district and approximately 850 in the Meridi and Iba sub-district.

1213 remain in Li Rangu Settlement and 85 in Meridi.

Those under treatment at Li Rangu are now limited to 170 which include 84 of the segregated advanced N2 and C3 cases.

63 cases have been admitted from outside during the year at Li Rangu, these being selected cases considered dangerous to the community.

151 new cases have been added to the register of outside lepers.

The conclusion that the first four years of treatment, balanced against a series of outside controls, is effective and worth trying, but that treatment extended over a subsequent period brings about comparatively little change, still holds good. For this reason the detailed analyses published for 1935 apply, generally speaking, for this year and are not rewritten.

The principle has been to continue treatment on cases :

- (a) who have “relapsed ” after an interval of rest.
- (b) who have persistently declined in spite of previous treatment.

All cases admitted since 1934 are ipso facto undergoing treatment. All C3 nodular cases are included in (b).

Selected groups from these are given experimental courses of treatment with methylene blue, trypan blue and fluorescein.

The fluorescein optimum course is said to be 6 weeks of bi-weekly injections of 20 c.c. of 1%. Actually more conservative quantities over longer periods have, for the most part, been tried. Trypan blue and methylene blue have been given in varying strength and quantities, the former causing toxic reaction more easily than the latter.

It is difficult to get a sufficient number of new cases not previously treated with sodium gynocardate upon whom to give these dyes a fair trial. There is no obvious evidence, so far, of any permanent benefit from their use.

Among the advanced segregated lepers 10 have improved, 46 are stationary, and 28 are worse after prolonged methylene blue treatment, these being out of a total of 84 under treatment.

Surveying the results of a six years campaign the following are among the most striking conclusions :—

1. Spontaneous “cures” appear to number about 10% among early untreated cases over 3 years observation. A further 3% only can be added after another 3 years observation.

By “cured” is meant not merely Wade’s definition “arrested without deformity,” but arrested without any clinical sign of the disease.

Relapse is now taken, in the strict sense of the word, to apply to cases 2½ years quiescent and then 6 years arrested, who then relapse. Therefore a watch over these apparent cures over the next decade is necessary before drawing a conclusion.

The same lapse of time is required to throw final and conclusive light upon the 1932-1935 analyses.

2. The “improved” constitute 44% of the treated compared with 15% of the untreated in the first three years. Only 12% of the former show further improvement after 6 years.

3. The proportion of those worse in the first 3 years is twice as great among the untreated as among the treated. Broadly speaking, over the whole period of the untreated cases, about 10% become worse; 9-14% improve, and the vast majority, constituting the remainder, become quiescent or arrested.

Of the treated cases 44% become arrested or quiescent after 3 years, but this is only increased to 56% after 6 years.

Li Rangu figures are as below :—

Remaining 1.1.1936	Admitted	Readmitted	Discharged	Died	Remaining 1.1.1937
1225	24	3	—	39	1213

Source Yubō :—

Remaining 1.1.1936	Admitted	Readmitted	Discharged	Deserted	Died	Remaining 1.1.1937
447	48	26	28	24	24	445

Wau :—

	Remaining 1-1-1936	Admitted.	Discharged.	Died.	Remaining 1-1-1937
Men ...	25	6	7	2	22
Women ...	11	2	3	—	10
Children ...	6	—	2	—	4
	42	8	12	2	36

DARFUR PROVINCE.

49 cases were under treatment during the year.

NORTHERN SUDAN.

In Omdurman the Church Missionary Society Hospital has 27 lepers under outpatient treatment.

Gedaref leper settlement which contained 24 lepers at the end of the year deals with those cases where home isolation is not available or desirable.

MALARIA.

A late rainy season with badly spaced rains, and an irregular fall in the level of the Nile, combined to create an ideal state of affairs for mosquito breeding.

Reports from all parts of the northern Sudan showed a heavy incidence in anopheline mosquitoes during the autumn.

Fortunately the public health services of outlying districts have been improved considerably in recent years, and although the incidence of malaria was considerably higher than normal it was possible to keep the disease within bounds.

BLUE NILE PROVINCE.

The incidence in Wad Medani and the Gezira showed a rise compared with 1935.

	1935		1936	
	Cases	Deaths	Cases	Deaths
Wad Medani Hospital ...	798	6	1177	7
Gezira Dispensaries ...	25785	—	27125	—

The rains in 1936 in Wad Medani were the heaviest since 1929 and the rise is largely due to this.

Malignant Tertian is the prevailing infection and the figures of the various types found on microscopic examination are as under :—

M.T.	B.T.	Q.
1790	194	65

The splenic index for the children in the Gezira Schools shows a decrease. The comparative figures from 1933 are as under :—

Year				Month.	Examined	No. found.	Percentage
1933	...	...	...	September	3,284	1,434	44
1933	...	...	...	November	4,261	1,742	41
1934	...	...	...	January	4,271	1,671	38
1934	...	...	...	June	4,117	1,611	39
1934	...	...	...	September	4,018	1,496	37
1934	...	...	...	November	4,986	1,804	36
1935	...	...	...	January	4,036	1,410	34.9
1935	...	...	...	June	2,616	825	31.5
1935	...	...	...	September	2,533	754	29.8
1935	...	...	...	November	3,460	967	27.9
1936	...	...	...	January	3,632	1,037	28.5
1936	...	...	...	June	3,396	693	20.4
1936	...	...	...	September	2,296	447	19.46
1936	...	...	...	November	3,010	754	25.04

KORDOFAN PROVINCE.

The incidence was high among officials and others in El Obeid after the rains, and in eastern Kordofan as a whole. The remainder of the province showed little change.

KASSALA PROVINCE.

An influx of non-immune immigrants coupled with adverse climatic conditions including an exceptionally heavy spate in the River Gash caused a marked increase in the incidence of malaria in Kassala town.

NORTHERN PROVINCE.

The incidence of malaria assumed almost epidemic proportions in parts of Merowe, Dongola and Wadi Halfa districts. The causes were:—

1. High Nile with formation of a large number of pools when the river fell.
2. The long period during which stagnant water remained in the irrigation canals and basin projects in Dongola area.
3. The Aswan Dam keeping the river at a high level for a longer period than previously, causing seepage.
4. Excess breeding out from mataras, wells, sagias, public zeers and pump schemes.

The dispensaries and dressing stations were able to deal with the situation adequately so far as treatment was concerned, but a permanent increase in the sanitary service will be required to prevent a repetition of the outbreak when favourable climatic and other factors for the breeding of mosquitoes again coincide.

Accordingly arrangements have been made to post sanitary overseers to Dongola and Merowe towns and to ensure regular inspections of these districts by sanitary inspectors or sanitary officers. Twenty extra mosquito men have been posted in the towns and villages along the river in the Merowe district, and a similar squad is being formed for Dongola district.

In Wadi Halfa district, Farras basin owing to the high level of water caused by the reservoir of the Aswan Dam being filled, proved a difficult malarial problem.

It is significant to note that in the southern half of the province where the sanitary service has been reorganised and strengthened recently, there was no epidemic malaria despite the adverse climatic conditions, or any increase except in the extreme south where heavy rainfall, occurring when the high river level made drainage difficult, resulted in an slightly increased incidence.

GENERAL.

Malaria remains the most important public health problem in the Sudan. Although it is possible to prevent the appalling epidemics which used to sweep over the northern Sudan, much disability and even loss of life is still caused by this disease. Investigations are at present being carried out regarding the mosquitoes in the Gezira, which it is hoped may enable anti-malarial work to be directed to better advantage.

Anti-malarial work is being carried out on a wider and more extensive scale as time goes on, but it is only possible to deal with the restricted areas such as towns, and irrigation schemes. For the majority of the population all that can be done is to ensure that medical aid is within reach if necessary, and to attempt, by constant propaganda, and such supervision as is possible, to persuade the people to use nets and to destroy the breeding places of mosquitoes.

The following table shows the spleen rate of children examined in the intermediate and village schools during the last three years. In the northern Sudan these figures provide a fairly accurate index of the endemicity of malaria,

but in the southern provinces where schools are few and where the children examined, are, to some extent, living under protected conditions the spleen rate does not indicate the incidence of malaria, which is high throughout the area.

PROVINCE.			DISTRICT.	% Spleen rate.		
				1934	1935	1936
NORTHERN	...	...	Wadi Halfa	0.1	3.2	0.7
			Dongola	12.4	11.0	16.1
			Berber	16.5	10.0	14.0
KHARTOUM	...	...	Khartoum	0.5	0.8	2.7
KASSALA	...	...	Port Sudan	2.8	1.0	1.6
			Kassala	25.5	21.0	23.7
BLUE NILE	...	...	Blue Nile	32.9	26.9	19.4
			Fung	54.8	56.4	47.2
KORDOFAN	...	...	Kordofan	40.0	32.2	41.1
DARFUR	...	...	Darfur	39.3	33.2	35.8
WHITE NILE	...	...	White Nile	31.9	31.6	37.4
UPPER NILE	...	...	Upper Nile	34.0	22.3	21.1
EQUATORIAL	...	...	Mongalla	11.1	11.6	23.5
			Bahr El Ghazal	49.3	19.3	19.4

RABIES

The incidence of this disease remains high.

Year				Number of persons receiving treatment	Deaths despite treatment	Total deaths
1932	...	...	...	226	4	8
1933	...	...	...	75	6	12
1934	...	...	...	198	6	8
1935	...	...	...	290	4	10
1936	...	...	...	373	1	8

One case who had received treatment died. Treatment was commenced 4 days after the bite and a full course of 14 injections was given. Hydrophobia developed 85 days after the bite, and the patient died the following day.

Khartoum Town became infected in 1935, and stringent measures were taken both to stamp out the disease and to prevent its reintroduction.

These included a heavier licence fee for keeping a dog so that the number of dogs owned by residents should be reduced to those owners who were prepared to pay heavily for the privilege and would presumably look after their dogs ; and a campaign to exterminate the stray dogs.

The sheep dog who wanders through the country with his master, and may be brought into the heart of a town particularly at night remains an insoluble problem. Control is practically impossible, and destruction would inflict grave hardship on its owner who depends on his dog to guard his sheep, and keep hyenas and jackals at bay.

ACUTE RHEUMATISM.

288 cases with five deaths were reported against 361 cases with four deaths in 1935.

The distribution of the cases was :—

PROVINCE.	Cases.	PROVINCE.	Cases.
Blue Nile	54	Kordofan	55
Darfur	15	Northern	67
Equatorial	15	Upper Nile	4
Kassala	35	White Nile	2
Khartoum	41		

SCHISTOSOMIASIS.

Measures taken in the Sudan against this disease during the past twelve years have been directed towards the prevention of infection of the canals and indigenous population of the irrigated area of the Gezira. This district is exposed to constant risk of infection from the thousands of immigrants who spend some time picking cotton to earn enough money to enable them to continue their journey from the western Sudan or West Africa to Mecca. A large percentage are suffering from schistosomiasis. In addition Arabs from the White Nile Province immediately west of the Gezira where there is a high incidence of rectal schistosmiasis invade the area during the picking season.

Experience in other countries shows that endemic schistosomiasis in an area of perennial irrigation has a disastrous effect on public health and can only be eradicated with difficulty. This effect would be aggravated in the Gezira by the fact that the resistance of the inhabitants is already lowered at certain times of the year by malaria.

The results of the widespread measures taken to deal with the menace have been successful to date, as the incidence of bilharziasis remains negligible among the indigenous population of the Gezira.

The measures consist of :

(1) Mass treatment in districts from which labour is drawn. In Dongola and Merowe districts of the Northern Province the incidence has been reduced from 17% in 1926 to 3.4% in 1936 by yearly examination of the population and treatment of those suffering from the disease.

In these districts few people now realize that they are suffering from the disease which is diagnosed by examination of urine at the yearly routine examinations at an early stage and when it is symptomless.

(2) Yearly survey and treatment of the population of the Gezira both indigenous and immigrant.

(3) The disinfection of canals to destroy the molluscs in those areas where locally contracted cases or infected molluscs are found.

(4) The examination and treatment where necessary for bilharziasis of outpatients attending at the Gezira dispensaries throughout the year.

(5) Resiting of villages, provision of village water supplies and the construction of pit latrines.

(6) Widespread propaganda, and stringent measures to prevent persons from fouling or bathing in canals.

NORTHERN PROVINCE.

Dongola and Merowe Districts (*Schistosoma haematobium*). A yearly survey is carried out in these districts, and the comparative figures for the last ten years are :—

YEAR.						Number examined.	Infections found.	Percentage.
1927	...	...	...	...	...	11,376	1,829	16.0
1928	...	...	...	...	...	12,213	2,259	18.0
1929	...	...	...	...	...	17,925	2,187	12.0
1930	...	...	...	...	...	26,094	2,443	9.3
1931	...	...	...	...	...	37,405	1,765	4.6
1932	...	...	...	...	...	49,077	2,470	5.0
1933	...	...	...	...	...	58,711	1,825	3.1
1934	...	...	...	...	...	46,054	1,768	3.8
1935	...	...	...	...	...	40,950	1,408	3.4
1936	...	...	...	...	...	37,334	1,268	3.4

Wadi Halfa District. (*Schistosoma haematobium*). Annual surveys were not carried out in this district until 1934 with the result that there is still a high percentage of infection among the population.

YEAR.						Number examined.	Infections found.	Percentage.
1934	...	...	...	...	...	20,180	3,927	19.46
1935	...	...	...	...	...	12,076	2,613	21.6
1936	...	...	...	...	...	12,437	1,439	12.9

Berber, Damer and Shendi Districts. (*Schistosoma haematobium*). The incidence of this disease remains low and facilities for treatment are available at hospitals and dispensaries, but no special measures are taken against the disease, except in the pump schemes, where mollusc destruction and surveys of sections of the population are carried out periodically.

It is of no importance from the public health point of view.

Damer District. (*Schistosoma Mansoni*). During 1935 vigorous measures were taken to stamp out a small focus of infection in the irrigated area at Zeidab, and 128 cases were found in the course of a survey of the population at risk.

No cases were reported from this area during the year, but it is too early to infer that the disease has been obliterated.

BLUE NILE PROVINCE.

The position remains satisfactory. The annual survey showed no appreciable change among the indigenous populations, and the incidence remains negligible. There is no evidence that the canals of the Gezira are becoming infected.

The following figures show the incidence of the disease among the indigenous population since 1926 :—

YEAR.	ADULTS.			CHILDREN.			TOTAL.		
	No. Exmd.	No. Infld.	%	No. Exmd.	No. Infld.	%	No. Exmd.	No. Infld.	%
1926	16,419	76	0.47	—	—	—	16,419	76	0.47
1929	—	—	—	2,341	37	1.60	2,341	37	1.60
1930	—	—	—	3,322	20	0.57	3,322	20	0.57
1931	11,102	84	0.75	6,895	51	0.74	17,997	135	0.75
1932	9,618	51	0.53	1,707	19	1.10	11,325	70	0.62
1933	14,188	28	0.20	3,288	27	0.82	17,476	55	0.31
1934	12,769	5	0.04	3,583	2	0.07	16,352	7	0.04
1935	13,902	8	0.06	2,945	12	0.40	16,847	20	0.12
1936	22,604	10	0.04	5,483	17	0.31	28,087	27	0.09

The annual surveys indicate that every year a few canals become infected, but that owing to the measures taken to destroy the infected snails in these canals, and to prevent reinfection, the infection does not make headway.

Dr. Goss, Senior Medical Inspector Blue Nile Province, makes the following observations :—

Our chief means of security against bilharzia are sanitary measures combined with treatment.

Preventative methods are of prime importance and comprise protection of canals against fouling and the supply of good drinking water from wells.

To prevent fouling three measures are taken: placing of villages not less than 300 metres from canals, fencing of canals and the provision of latrines.

The provision of deep wells is a certain remedy against bilharziasis, provided they are used, but the presence of a perennial supply of canal water all over the Gezira is too great a temptation to the average native and he will usually take water from a canal even if his village has a well. The majority of old wells in this area have fallen into disuse. Steps are being taken to open up old wells and to sink new ones. Five new wells have been sunk in the new Fawar area but, and before further expense is incurred, it must be seen whether they are being used. Issuing of regulations is an easy matter, but their observance relies entirely on the common sense and good will of the native.

The co-operation of the native still lags very much behind the efforts of the Government and without a small army of officials we cannot be sure that sanitary regulations are observed over such a widespread area as the Gezira.

The yearly influx of labour from the western Sudan and outside, is a real danger. Large numbers of these people are infected with bilharzia. They have no idea of sanitation and are a wandering population under very little control. Formerly an attempt was made to examine them at various quarantine stations outside the Gezira but this examination was easily evaded.

The key to the solution is to have them examined and treated before they enter the Gezira, but the difficulties of carrying this out are great as very few will present themselves voluntarily.

SCURVY.

89 cases were reported with 2 deaths.

SLEEPING SICKNESS.

EQUATORIAL PROVINCE.

150 cases were reported compared with 91 in 1935. The following table shows the number of cases since 1918.

YEAR.			Tembura.	Yei.	Kajo-Kaji.	Nimule.	Yambio.
1918	...	...	255	32	42	2	—
1919	...	...	621	15	63	8	—
1920	...	...	192	32	54	2	—
1921	...	...	656	24	31	12	—
1922	...	...	434	7	68	35	—
1923	...	...	839	3	5	4	4
1924	...	...	276	—	82	9	14
1925	...	...	203	—	10	9	—
1926	...	...	79	—	3	—	—
1927	...	...	49	1	—	18	3
1928	...	...	26	1	—	—	2
1929	...	...	18	—	—	—	—
1930	...	...	37	—	—	—	1
1931	...	...	61	—	—	—	1
1932	...	...	49	—	—	—	14
1933	...	...	70	1	—	—	12
1934	...	...	20	4*	6†	—	2
1935	...	...	80	1	10	—	—
1936	...	...	142	—	8	—	—

* 3 contracted in Belgian Congo. † Infected in Uganda.

150 cases were reported from two areas, Source Yubo in the western half of the Zande district, and Kajo-Kaji in Yei district.

Kajo-Kaji. Eight cases were detected among the Kakwa and Kuku tribes. A section of the Kakwa who lived close to the frontier were moved in 1935 because of frequent infection and intercommunication with the infected areas of Uganda. A few cases have occurred since among this section, and the local

fly along one river have become infected. The usual precautionary measures have been taken including the provision of extensive clearings at watering places.

Source Yubo. 142 new cases were reported in 1936. As in previous years the majority of cases came from areas close to the frontier.

Easy intercommunication with infected areas across the frontier and with neighbouring districts in the Sudan, the local topography which is ideal for tsetse fly breeding and the consequent difficulty in siting areas for cultivation suitably, make the endemic areas of this district a difficult problem to deal with.

A sudden increase in the honey trade, which caused the Zande to spend weeks at a time in the forest often across the frontier, resulted in many absentees from the regular sleeping sickness inspections, and in many new infections.

In addition the population of this region is increasing rapidly which means an increasing difficulty in keeping the inhabitants from contact with fly.

Recent experience shows that the clearing where main roads cross streams, and at drinking places should be considerably more extensive than has been considered necessary in the past.

Extra funds have been provided for this purpose.

The inhabitants of this district have been subject to stringent regulations for 16 years, and it is only human that they should be becoming apathetic, and indifferent. Many migrate to other infected areas where regulations are not so stringent as in the Sudan. These emigrants usually return after a while bringing infection with them.

It is reassuring to note that no locally infected case has been reported in the settlement where the clearing of streams is carried out most thoroughly, thus justifying the concentration and treatment of all cases of sleeping sickness in fly-free settlements which is carried out in the Sudan. It is of interest to note that it has been found possible to keep herds of cattle in these settlements despite the fact that they are sited in the most badly infected fly region in the Sudan.

Passes. Three dispensaries now countersign passes to and from Uganda and examine for signs of sleeping sickness. Each is equipped with a microscope and staffed by a dresser who has had special training in sleeping sickness work. This pass system commenced in September and to date 439 persons have left the Sudan for Uganda, and 588 have returned to the Sudan from Uganda.

SYPHILIS AND YAWS.

There is little change of report in the incidence of these diseases.

The incidence of yaws has been reduced to negligible proportion except in the extreme south and adequate facilities exist for the treatment of syphilis.

The Obstetric Surgeon is carrying out investigations which show that the incidence of syphilis in pregnant women, although high, is not a common cause of abortion.

Total number of abortions.	Kahn tested	Negative	Positive
40	38	33	5

13% of these cases showed a positive Kahn reaction compared with 8.3% in 1935, 4.6% in 1934 and 6% in 1933.

637 free outpatients tested in 1936 showed 14.3% positive results compared with 19% in 1935.

The various percentages of cases treated over the last four years fluctuate so much and the total number of cases is so small that it is impossible to draw any conclusion regarding the incidence of this disease.

During the year Port Sudan was notified internationally as a port at which sailors of all nationalities could obtain free treatment for venereal disease in accordance with the terms of the Brussels Convention.

TUBERCULOSIS.

868 cases were admitted to hospital of whom 519 were pulmonary and 349 non-pulmonary.

The northern districts of the Northern Province continue to show a high incidence owing to the constant introduction of infection by inhabitants who have worked in Egypt.

Nevertheless the incidence shows no sign of an increase in the northern Sudan.

In the southern Sudan unfortunately the disease was introduced many years ago and is widespread in certain districts.

Accurate information is more difficult to obtain than in the north, but there is no evidence to suggest that the incidence of the disease is increasing.

45 of the pulmonary cases were foreigners, and 11 were Sudanese who had contracted the disease in Egypt. The nationality of foreigners affected was as follows :—

					Pulmonary.	Non-pulmonary.
					—	—
West Africans	...	...	...	...	13	8
Abyssinians	...	...	...	...	5	3
Eritreans	...	...	...	...	8	7
Yemenis	...	...	...	...	5	1
Somalis	...	...	...	...	3	3
Indians	...	...	...	...	3	1
Egyptians	...	...	...	...	1	—
Greeks	...	...	...	...	3	—
British	...	...	...	...	3	1
Syrians	...	...	...	...	1	—
					—	—
					45	24

The following table shows the admissions and percentage rate of tuberculosis to other admissions for the northern and southern Sudan for the last four years:—

	1933		1934		1935		1936	
	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.	Pulmonary.	Non-Pulmonary.
NORTHERN SUDAN.								
Admissions for TB	419	352	452	343	415	302	451	313
Total admissions	49,104		57,003		58,445		65,392	
%TB to total adms.	0.85	0.72	0.79	0.60	0.71	0.51	0.69	0.47
	1.57%		1.39%		1.22%		1.16%	
SOUTHERN SUDAN.								
Admissions for TB	102	42	105	94	86	69	68	36
Total admissions...	21,211		28,987		30,638		30,689	
%TB to total adms.	0.48	0.20	0.36	0.32	0.28	0.22	0.22	0.11
	0.68%		0.68%		0.50%		0.33%	

The following table shows the admissions for pulmonary and non-pulmonary tuberculosis in the last ten years and the percentage rate of tuberculosis cases to other admissions:—

YEAR.	Pulmonary.		Non-Pulmonary.		Total.	
	Admissions.	Percentage.	Admissions.	Percentage.	Admissions.	Percentage.
1927 ...	226	0.86	178	0.69	404	1.55
1928 ...	260	0.82	327	0.75	497	1.57
1929 ...	302	0.65	322	0.70	624	1.35
1930 ...	480	0.95	300	0.61	780	1.56
1931 ...	390	0.65	294	0.49	684	1.14
1932 ...	421	0.70	281	0.47	702	1.17
1933 ...	521	0.74	394	0.56	915	1.30
1934 ...	557	0.65	437	0.50	994	1.15
1935 ...	501	0.56	371	0.42	872	0.98
1936 ...	519	0.54	349	0.36	868	0.90

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The following are the comparative figures for the northern and southern Sudan, shown as percentage of total admissions for the last four years :—

	1933		1934		1935		1936	
	Malignant.	Non Malignant.	Malignant.	Non Malignant.	Malignant.	Non Malignant.	Malignant.	Non Malignant.
NORTHERN SUDAN.								
Admissions for new growths	163	363	145	338	137	328	167	315
Total admissions ...	49,104		57,003		58,445		65,392	
% total admissions	0.33	0.74	0.25	0.59	0.23	0.56	0.25	0.48
SOUTHERN SUDAN.								
Admissions for new growths	20	113	21	122	32	156	25	251
Total admissions ...	21,211		28,987		30,638		30,689	
% total admissions	0.09	0.53	0.07	0.42	0.10	0.51	0.08	0.81

ENTERIC FEVER.

135 cases of typhoid and paratyphoid fevers were reported with 17 deaths.

Cases reported since 1927 are as follows :—

									Cases.
1927	...	...	...	...	...	...	...	...	52
1928	...	...	...	...	...	...	...	...	132
1929	...	...	...	...	...	...	...	...	86
1930	...	...	...	...	...	...	...	...	73
1931	...	...	...	...	...	...	...	...	100
1932	...	...	...	...	...	...	...	...	85
1933	...	...	...	...	...	...	...	...	204
1934	...	...	...	...	...	...	...	...	188
1935	...	...	...	...	...	...	...	...	246
1936	...	...	...	...	...	...	...	...	135

Khartoum Province shows a reduction from 175 cases in 1935 to 76 this year.

The incidence also shows a decrease in Dongola Town where efforts have recently been made to improve the sanitation owing to the heavy incidence of this disease.

UNDULANT FEVER.

58 cases with 4 deaths were reported in 1936, compared with 28 cases in 1935, and 51 in 1934.

The distribution for the past five years is as follows :—

Province.			1932	1933	1934	1935	1936
<hr/>			<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Blue Nile ...	...	...	11	6	17	10	15
Darfur ...	...	...	—	7	7	1	—
Equatorial ...	...	...	—	—	2	2	14
Kassala ...	...	...	11	11	21	12	12
Khartoum ...	...	...	2	1	—	1	5
Kordofan ...	...	...	—	—	—	—	8
Northern ...	...	...	—	—	1	—	1
Upper Nile...	...	...	1	—	1	2	3
White Nile...	...	...	1	—	2	—	—
			<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
			26	25	51	28	58
			<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

PUBLIC HEALTH AND HYGIENE.

BY MR. H. A. CROUCH.

GENERAL REMARKS.

Meteorology. In the Northern Sudan the rains were late and badly spaced. The recorded rainfall showed great variation even in closely adjacent districts. In Khartoum the figure was below the average but in the Blue Nile Province the rains were the heaviest since 1929.

The Nile flood was high but did not reach the levels of 1934 and 1935. The fall of the river was fluctuating and irregular and residual pools on the foreshore gave rise to trouble in several areas.

Climatic conditions were apparently very favourable to mosquito breeding and reports from all parts of the Northern Sudan showed a heavy incidence of anopheline infections during the autumn. The incidence of malaria was considerably higher, especially in the Dongola district of the Northern Province.

Interesting observations were recorded in the Blue Nile Province regarding climatic conditions in relation to the incidence of cerebrospinal meningitis. As usual the epidemic occurred in the dry season. The commencement of the epidemic, and the rise and fall in the number of cases appeared to show a definite relation to temperature and humidity. The epidemic started immediately the humidity curve crossed below the temperature curve and ceased immediately the humidity curve rose above the temperature curve. Similarly the peak of the epidemic coincided with the lowest point of the humidity curve.

General Sanitation. The epidemic of cerebrospinal meningitis during the early part of the year and the increased incidence of malaria during the last quarter, severely taxed the resources of the public health staff. Nevertheless it has been possible to make satisfactory progress in the extension and consolidation of the sanitary services in most provinces.

With the appointment of qualified sanitary overseers to the smaller towns it has been possible to establish a health organization in areas, where, hitherto, sanitary measures have been perfunctory or entirely absent.

Following on the recommendations made by British staff on tour, sanitary services in towns and on the main lines of communication have been improved and augmented. In Dongola, where enteric fever has been endemic during recent years, good progress has been made in the provision of properly constructed pit latrines in private houses. During the year, 195 new latrines have been installed and 78 repaired or altered to conform with the regulation pattern.

Next to conservancy, mosquito control remains the chief public health problem. Outside the towns little can be done in this direction as the cost of effective measures is prohibitive. Even in towns, during the rainy season, though breeding places can be effectively controlled, it is impossible to prevent the ingress of adult mosquitoes from adjacent flooded areas. Hence the protection of the individual, both in urban and rural areas, must be the principal measure of defence. In this connection the provision of mosquito proofed houses and rest houses in malarious areas is of first importance. Where such provision has been made the incidence of malaria would be reduced further if householders paid more attention to the destruction of mosquitoes which have sought refuge in their houses, servants quarters and gardens. Daily "flitting" of rooms and outhouses is of the greatest importance and with a view to encouraging the practice a cheap and effective insecticide has been prepared and shortly will be available for purchase at all hospitals.

Where mosquito proofed houses are impractical the wider use of the mosquito net should be encouraged. Officials' servants must be issued with nets and made to use them. In rural areas, where control of mosquito breeding cannot be attempted this is the only useful measure of protection. Much can be done by propaganda and by the display of mosquito nets in merchants' shops.

In the Southern Sudan apart from sleeping sickness, leprosy, and malaria in towns, little continued effort has been possible in the control of the great preventable diseases which cause so much hospitalization. Guinea worm, ankylostoma, tropical ulcer, bilharziasis, filariasis and dysentery are widespread and the cause of great disability. Prevention postulates the provision of safe latrines, the safeguarding of water supplies, improved housing, a more balanced diet and an enlightened population. Cooperation of the administrative, educational and agricultural authorities is necessary to achieve this. With the posting of a British Sanitary Inspector to Juba and the establishment of a training school for medical and sanitary staff, a good beginning has been made. Progress will be slow, owing to the difficulty of obtaining suitable material for training, but eventually it is hoped to build up a public health organisation comparable to that of the Northern Sudan.

Water Supplies. No purification plants or piped water supplies have been installed during the year.

Plans are under consideration for schemes at Wadi Halfa, Malakal and Torit.

Routine examination of established supplies has been carried out during the year with satisfactory results.

Chlorosene and ammonia have been used widely in the purification of temporary and domestic supplies.

Sanitary Control of Aircraft. All aircraft arriving at, and departing from frontier aerodromes are inspected for mosquitoes and disinfected. As a further precaution, these measures are repeated at Malakal on north bound aircraft, and at Khartoum on all aircraft arriving.

All specimens captured are identified by the Medical Entomologist and a record kept of their probable port of origin. During the year, 741 insects were collected from commercial aircraft arriving at Khartoum, from Egypt (137), Uganda (179), Eritrea (375), Nigeria (12) and Geneina and Western Darfur (38).

The majority of these insects have been determined and include 48 mosquitoes, none of which were *Aedes aegypti*, 9 specimens of *Simulium*, 2 *Tabanidae*, 1 flea and 600 *Musca* spp.

The following inspections of aircraft were carried out during the year :—

Wadi Halfa	...	...	...	...	...	...	...	...	792
Juba	...	...	...	...	...	...	...	...	310
Malakal	...	...	...	...	...	...	...	...	315
Kassala	...	...	...	...	...	...	...	...	287
Khartoum	...	...	...	...	...	...	...	...	667

Nutrition. Apart from a number of isolated cases of scurvy reported from the northern provinces, few frank cases of dietary deficiency have come to notice. A case of sprue was diagnosed in a soldier in Kassala Province and a deficiency is suggested as the probable cause of pyorrhoea which is prevalent at Raffili in the Bahr-el-Ghazal district. In addition to the evidence provided by the appearance of these cases, there is reason to suppose that in many areas the population is in a state of subnutrition and that the lack of an adequate or a balanced diet is an important factor in the incidence of endemic and epidemic disease.

The Senior Medical Inspector of the Nuba area of Kordofan Province makes the following observations: The dietary evils affecting the Nuba as a whole apparently are protein subnutrition, animal protein subnutrition, animal fat subnutrition, lack of vitamin A and C, lack of sterols and lack of sodium, chlorine, iron, calcium and phosphorus. His physiological reaction to this deficiency is a susceptibility to certain diseases, an apparent immunity to others, a craving for meat, fat and salt and probably his pigmentation. The strong sun probably alone prevents his developing rickets. Among diseases which can in some way be related to malnutrition are meningitis and pneumonia, tropical ulcer, leprosy, tuberculosis, bilharzia and malaria. His diet could be improved by the following simple additions or substitutions: (a) substitution of wheat for millet (b) the cultivation of soya beans, lemons, guavas, green vegetables, red tomatoes and paw-paws (c) dried or tinned salted fish and meat (d) more and better eggs (e) more and better milk. Action on these lines has been taken during the year.

Housing. The epidemic of cerebrospinal meningitis once more emphasised the importance of overcrowding as the main factor in the spread of the disease. In the outbreak at Wad Medani it was noticeable that the vast majority of cases came from that quarter of the town where living conditions were of a low standard and the area congested. It is significant that here and elsewhere few or no cases occurred in schools and prisons or amongst Europeans.

In the Northern Sudan steady progress is made each year in the clearing of insanitary and overcrowded areas. Where new lodging areas have been allotted due attention has been paid to a proper layout with wide streets and the construction of an improved type of dwelling.

It is satisfactory to note that in many places Sudanese employers of labour have erected, of their own accord, commodious and well ventilated houses for themselves, and in a few instances have sought advice regarding the a suitable type of dwelling for their employees.

Housing improvement in rural areas, owing to custom and local prejudice is a formidable problem but a beginning has been made. Opportunity was taken in the Fawar Area of the Blue Nile Province to build planned villages. The villages are planned in rectangles. Compounds are 10 metres square with one house in the corner, and roads are 15 metres wide. Two extra compounds are provided for the village headman and a shop. In the centre is the village square with a deep well. To the flank of the village is a deep pit latrine. In theory the plan is good, but an assessment of results will not be possible for some time.

During the year a committee has been set up to consider the best types of native houses from the economic and hygienic point of view. Results will be incorporated in an exhibit in the Graphic Museum and the establishment of model dwellings in lodging areas in Khartoum and other province headquarters. Such a scheme provides a convenient form of propaganda. It is only by the force of example and healthy rivalry that gradually the standard of housing can be raised.

HEALTH ORGANISATION

Medical Officers of Health. Public health work in Khartoum Province, which includes the towns of Khartoum, Khartoum North and Omdurman, is under control of the Medical Officer of Health, Khartoum.

The population of the three towns is estimated at 179,287; that of the rest of the province at 83,896.

In the other provinces the Medical Officer of Health is the Senior Medical Inspector of the province. In these provinces it is necessary, in order to ensure economy of effort and the maximum efficiency in the use of personnel, that the administration, both of preventive and curative medical work, should be combined under a single head. This is not only the case in the less developed provinces, but is felt to be even more important in a thickly populated district such as the Gezira Irrigated area.

British Sanitary Inspectors. Two British Sanitary Inspectors retired to pension during the year. The cadre is thus reduced to 13 whose distribution is as follows:—

Khartoum	...	...	3	Blue Nile Province	...	4
Omdurman	...	...	2	Port Sudan	...	1
Juba	...	...	1	Northern Province	...	2

In July, a British Sanitary Inspector was posted at Juba to establish a training centre for Southern staff and to supervise the sanitary work in Equatorial Province.

Quarantine Medical Officers. Quarantine work at Port Sudan is in charge of a medical officer working under the supervision of the Senior Medical Inspector. Port sanitation is carried out by a British Sanitary Inspector who has had special training in this branch of the service.

A medical inspector and a medical officer are posted at Suakin during the pilgrim season; an assistant medical officer is in permanent residence.

Wadi Halfa quarantine is under the supervision of the Senior Medical Inspector assisted by a medical officer.

Sudanese Sanitary Officers. Two candidates sat for the diploma of the Royal Sanitary Institute in January, of whom one was successful, and four in November, all of whom qualified, one at the second attempt.

Six sanitary officers have passed the examination since its institution in 1934. Their distribution is as follows:—

Blue Nile Province	...	2	Northern Province	...	1
Kordofan Province	...	1	Upper Nile Province	...	1
Omdurman	...	...			1

This new cadre of officials is already proving to be a valuable addition to the public health service.

It is the intention to post at least one sanitary officer to each province where British staff is not available.

Sanitary Overseers. In the past these officials were trained locally and paid by the local authority, with the result that no universal standard of training and efficiency was laid down and maintained.

In 1935 arrangements were made for candidates, of a satisfactory standard of education, to undergo a course of instruction in Khartoum and pass a qualifying examination. 36 qualified during the past year and were posted to towns and districts throughout the Sudan. It is estimated that a similar number are still needed to meet requirements in outlying districts.

Dispensary Staff. In the course of training for assistant medical officers instruction is given in the principles of hygiene and sanitation. In outlying districts where no sanitary staff is available the assistant medical officer is responsible for public health work in his area.

THE HEALTH AND SANITATION OF TOWNS.

(a) KHARTOUM PROVINCE

GENERAL.

An epidemic of cerebrospinal meningitis commenced in February. The case incidence reached a peak during April and the epidemic finally flickered out with the advent of the rains.

There was no other serious outbreak of epidemic disease.

The incidence of malaria remained low during the greater part of the year but there was a sharp rise during the last quarter when apparently conditions were especially favourable for the breeding out of anophelene mosquitoes.

There was a very considerable fall in the incidence of enteric fever as compared with last year.

Progress was made with routine measures of sanitary improvement.

The school medical service and the maternity and child welfare clinics continued to function satisfactorily.

POPULATION.

The population of the province was estimated as 263,183. The following table shows the estimated population of each locality :—

	Men.	Women.	Children.	Total.
Khartoum	16,617	14,063	16,306	46,986
Khartoum North	6,906	7,532	9,003	23,441
Omdurman	27,921	36,741	48,198	112,860
Jebel Aulia	3,023	533	558	4,114
Rest of the Rural District	19,763	26,350	33,669	79,782
TOTAL	74,230	85,219	107,734	267,183

Of the above, those shown below were non-natives of the Sudan :—

	Men.	Women.	Children.	Total.
Khartoum	3,173	2,109	2,199	7,481
Khartoum North	312	251	550	1,113
Omdurman	629	406	775	1,810
Jebel Aulia	1,070	126	115	1,311
Rest of Rural District	—	—	—	—
TOTAL	5,184	2,892	3,639	11,715

The above figures show a decrease in the estimated population of 8,687 over the figures given in 1935.

The average monthly strength of British Troops stationed in the Province during the year and not included in the above figures was :—

Khartoum	882
Khartoum North	388
TOTAL	1,270

BIRTHS AND DEATHS.

4,223 births and 2,650 deaths were registered during the year, an excess of births over deaths of 1,753. Births registered showed an increase of 31 and deaths an increase of 550 compared with the figures for 1935.

Deaths by Age :—

Age-Period.	0-1	1-5	5-10	10-20	20-40	40-60	Over 60	Total
Deaths ...	297	337	129	169	457	313	948	2,650

ANALYSIS OF THE CAUSES OF DEATH.

The following table is the result of an analysis of the cause of death in 947 cases certified by qualified medical practitioners :—

CAUSE OF DEATH.	AGE PERIODS.									TOTAL
	0—1	1—5	5—15	15—25	25—35	35—45	45—55	55—65	Over 65	
Cerebrospinal meningitis ...	7	19	63	27	25	14	9	3	5	172
Pneumonia & bronchitis ...	19	31	9	17	15	22	13	12	22	160
Diarrhoea, enteritis & dysentery	21	27	2	5	11	5	4	7	18	100
Death from unnatural causes	4	10	14	6	19	16	11	7	8	95
Cardiac disease ...	—	2	3	8	8	3	15	19	34	92
Genito-urinary disease and uraemia ...	—	2	2	—	6	7	5	6	12	40
Fever, malaria and black- water fever ...	1	5	4	1	6	6	3	3	3	32
Pulmonary tuberculosis ...	—	—	—	3	15	8	3	—	2	31
Abdominal disease, acute ...	—	—	2	2	8	9	4	3	3	31
Cerebral haemorrhage & thrombosis ...	—	—	—	2	1	3	3	5	16	30
Septic conditions ...	4	2	3	3	4	3	2	2	2	25
Old age... ..	—	—	—	—	—	—	—	1	23	24
Congenital defects, malnutri- tion ...	20	2	—	—	—	—	—	—	—	22
Cancer ...	—	—	—	—	4	1	1	4	9	19
Childbirth ...	—	—	—	4	8	3	—	—	—	15
Non-pulmonary tuberculosis...	—	—	2	3	2	1	3	—	1	12
Enteric fever ...	—	2	3	2	2	1	1	—	—	11
Syphilis ...	5	1	—	—	—	1	—	—	1	8
Kala-azar ...	—	—	1	3	1	—	—	—	—	5
Diphtheria ...	—	2	—	—	—	—	—	—	—	2
Tetanus ...	—	—	1	—	—	1	—	—	—	2
Hydrophobia ...	—	1	—	—	—	1	—	—	—	2
Other causes ...	—	2	—	3	3	5	1	1	2	17
TOTAL ...	81	108	109	89	138	110	78	73	161	947

COMMUNICABLE DISEASES.

An epidemic of cerebrospinal meningitis, which reached considerable proportions, broke out in February.

During the last quarter of the year the incidence of locally contracted malaria attained mild epidemic proportions. The increase in local cases was preceded by a sharp rise in the number of cases reported from the Rural District during August.

There was a marked fall in the number of cases of enteric fever. The incidence of primary cases of dysentery showed a slight rise.

Certain of the communicable diseases are dealt with at greater length in the following sections.

COMMUNICABLE DISEASES

SHOWING NUMBER OF CASES NOTIFIED AND PLACE.

Disease	Khartoum Local Cases	Khartoum North Local Cases	Omdurman Local Cases	Total of Local Cases	Rural Dist. Cases	Imported Cases	Relapsed Cases	Grand Total
Chickenpox ...	46	13	43	102	11	7	—	120
Diphtheria ...	7	2	2	11	1	1	—	13
Meningitis cerebrospinal ...	51	55	190	296	24	40	—	360
Bilharziasis...	—	—	13	13	5	33	—	51
Dysentery amoebic	—	1	78	79	96	156	103	434
Dysentery bacillary	15	9	2	26	1	1	4	32
Enteric fever ...	19	2	46	67	6	3	—	76
Leishmaniasis ...	—	—	—	—	—	7	—	7
Leprosy ...	—	—	3	3	1	13	—	17
Malaria ...	100	34	80	214	2,227	728	205	3,374
Mumps ...	5	16	5	26	—	—	—	26
Tuberculosis, pulmonary ...	17	7	18	42	9	44	—	95
Tuberculosis, non-pulmonary ...	12	1	17	30	6	12	—	48

CHICKENPOX.

120 cases of chickenpox were notified during the year, an increase of 31 cases as compared with 1935. One imported case was discovered in December, 1935 and the disease broke out in Khartoum in January, persisting in mild epidemic form until May. 39 cases, in February, represented the highest monthly incidence.

DIPHTHERIA.

13 cases were notified, of which 2 were in non-natives of the Sudan. 2 deaths occurred, both in children aged under 5 years.

CEREBROSPINAL MENINGITIS.

An epidemic of cerebrospinal meningitis commenced towards the end of February. The incidence of the disease attained its peak during April and flickered out during June and July. 4 cases occurred at the end of the year.

General Incidence.

51 cases occurred in Khartoum, 55 in Khartoum North, 190 in Omdurman, 19 at Gebel Aulia and 5 in the rest of the Province. 40 imported cases were notified in Khartoum Province. 5 cases occurred in February, 72 in March, 203 in April, 58 in May, 11 in June, 7 in July, 1 in October and 3 in December.

Since 1926 epidemics of cerebrospinal meningitis have attacked Khartoum Province in 1931, 1934 and 1936. Sporadic cases have occurred in most of the remaining years. The following tables give a comparison between the three epidemics :—

MONTH.	1931			1934			1936		
	Cases	Mean Relative Humidity	Rainfall M/ms.	Cases	Mean Relative Humidity	Rainfall M/ms.	Cases	Mean Relative Humidity	Rainfall M/ms.
February ...	3	20	—	—	32	—	5	31	—
March ...	34	17	—	7	21	—	72	23	—
April ...	70	11	—	14	21	—	203	22	—
May ...	65	12	Drops	55	34	134	58	23	2.2
June ...	43	28	17	13	54	59.5	11	39	3.5
July ...	6	50	2.1	—	64	35.5	7	58	18.4
Rest of the year	3	—	203	—	—	119	4	—	88.6
TOTAL cases ...	224			89			360		

In each year it will be seen that the termination of the epidemic coincided with the first measurable rainfall. In 1934, when 80 of 89 cases occurred in the Jebel Aulia district, there was unusually heavy rainfall in May and the epidemic ceased abruptly. In 1931 and 1936 with a more gradual onset of the rains the epidemics tended to die out more slowly. The epidemic of 1936 was notable in the rapidity with which it attained its peak and in the fact that it had commenced to subside before the advent of the first rain and before there was any marked rise in the relative humidity. The severity of this epidemic as compared with those of other years may have been responsible for this phenomenon, the probability being that a high percentage of the susceptible population were infected early in its course. Both the epidemics of 1934 and 1936 were coincident extensive outbreaks of the disease in the western Sudan.

Sex Incidence :—

[illegible]

The greater incidence in males has a bearing on the epidemiology of the disease. In an epidemic of this nature it is improbable that the disparity between the sexes is due to hidden cases amongst females, who are usually the more backward in seeking medical aid. From some aspects it would appear that females are more exposed to infection than males. They are more apt to live under conditions of overcrowding and it is more difficult to persuade them to adopt the elementary hygienic precaution of sleeping in the open air. The disparity in the sex incidence is probably due to the greater physical exertion and exposure to sun to which the men are subject. Of all cases amongst men the great majority occurred in those engaged in arduous manual labour.

Age Incidence.

Age periods.	0-1	1-5	5-15	15-25	25-35	35-45	45-55	55-65	Over 65	Not known
Cases ...	23	49	136	55	43	16	7	13	15	3

Mortality.

251 deaths were reported, a case mortality rate of 69.7%. The mortality rate according to age was as follows:—

Age periods.	0-1	1-5	5-15	15-25	25-35	35-45	45-55	55-65	Over 65	Not known
Mortality rate %	100	65.3	64	69	58.1	81.3	85.7	82.3	100	33

PROPHYLAXIS.

Cases were isolated in a quarantine hospital established on the outskirts of Omdurman. Contacts were quarantined for a period of 7 days in their houses. By order and by widespread propaganda every effort was made to avoid overcrowding, to encourage sleeping out and to ensure early notification of all cases or suspected cases. Vitamin "A" extract was distributed regularly amongst many of the pupils in the schools. There is reason to suppose that general prophylactic measures were successful in keeping the epidemic within bounds until the advent of the first rains secured its termination.

DYSENTERY.

434 cases of amoebic dysentery and 32 cases of bacillary dysentery were notified during the year. In 1935 the figures were 476 and 29 respectively.

79 of the cases of amoebic dysentery were presumed primary infections contracted in the three towns. All save one occurred in Omdurman. It is certain that a number of cases of this disease escaped notification, but there is no doubt that the disease is more prevalent in Omdurman than elsewhere in the urban districts.

Again there is little doubt that the number of notifications of bacillary dysentery bears no relation to the actual bacteriological incidence of the disease. In the Sudanese, apparently, this disease usually assumes a very mild form and frequently tends to clear up with a minimum of treatment.

AMOEBIC DYSENTERY.

Primary Cases by Nationality.

Egyptian	...	...	...	...	...	...	...	...	1
Sudanese	...	...	...	...	...	...	...	...	78
									<hr/> 79

Primary Cases by Sex.

Male	...	...	...	...	...	...	...	...	30
Female	...	...	...	...	...	...	...	...	49
									<hr/> 79

Primary Cases by Age

Age periods.	0-5	5-15	15-25	25-35	35-45	45-55	55-65	Over 65
Cases	...	...	...	...	...	...	...	...
	16	15	19	17	6	4	1	1

BACILLARY DYSENTERY.

Cases by Nationality.

British...	...	...	...	...	...	...	...	21
Sudanese	...	...	...	...	...	...	...	11
								<hr/> 32

Cases by Sex.

All cases notified occurred in males.

Cases by Age.

Age periods.	0-5	5-15	15-25	25-35	35-45	45-55	55-65	Over 65
Cases	...	...	...	...	...	...	...	...
	3	—	11	10	5	2	—	1

Causal Organism.

B. Flexner	...	...	...	...	...	...	...	13
B. Shiga	...	...	...	...	...	...	...	11
B. Schmitz	...	...	...	...	...	...	...	4
B. Sonne	...	...	...	...	...	...	...	1
Clinical	...	...	...	...	...	...	...	3
								<hr/> 32

ENTERIC FEVER.

The steady increase in the incidence of this disease which was noted in the last three Annual Reports was not maintained during 1936. The number of notifications was fewer than in any year since 1932.

During the year 73 cases occurred in the Province and 3 were imported from outside. 19 cases occurred in Khartoum, 2 in Khartoum North, 46 in Omdurman and 6 in the Rural District. In the previous year 175 cases were notified, in 13 of which the infection was contracted outside the Province.

The cases were spaced fairly evenly throughout the year with 11 infections in May and August respectively as the monthly peaks of maximum incidence. Cases occurred sporadically and were widely scattered through the district. Only in rare instances was it possible to suspect a common source of infection. Evidence that the disease was transmitted by milk or water supplies was entirely lacking.

In previous years the period of maximum incidence of enteric fever has been during and subsequent to the rainy season. During this season it is possible that the natural resistance to infection with bowel organisms is lowered and optimum conditions are presented for the survival of such organisms outside the body.

In 1936 the rainfall was exceptionally light. It may be that this factor played a part in the decreased incidence of the disease during the year.

Cases by Nationality.

Egyptian	...	...	...	...	...	...	...	...	4
Syrian	...	...	...	...	...	...	...	...	1
Greek	...	...	...	...	...	...	...	...	1
Armenian	...	...	...	...	...	...	...	...	1
Sudanese...	...	...	...	...	...	...	...	...	69
									76

Cases by Sex.

Male	...	...	...	...	...	...	...	...	39
Female	...	...	...	...	...	...	...	...	37

Cases by Age.

Age periods.	0-5	5-15	15-25	25-35	35-45	45-55	55-65	Over 65
Cases	9	35	18	9	4	1	—	—

Type of Organism.

One case was due to *B. paratyphosum* A, the remainder were all infections with *B. typhosum*.

Mortality.

Deaths	...	...	...	...	...	...	...	11
Mortality rate	...	...	...	...	...	...	...	14.5 %

MALARIA.

The recorded rainfall in Khartoum was only 122.7 mms. of which 48.5 mms. fell during August.

The Nile failed to reach the abnormally high levels attained in 1934 and 1935. The rise and fall of the river were comparatively steady and no undue difficulty was experienced in the control of mosquito breeding in pools on the foreshore.

In spite of natural conditions which appeared fairly normal and not particularly favourable to mosquito breeding, there was an increase of 1,238 in the number of cases of malaria reported as compared with last year. Primary

cases contracted in the three towns numbered 214 (52) ; 2,227 (1,226) cases were reported from the Rural District ; there were 728 (667) imported and 205 (191) relapsed cases. The figures in brackets refer to the number of cases reported in 1935.

151 of the 214 primary cases within the three towns occurred in the last four months of the year.

This increased incidence was heralded by a sharp rise in the number of cases in the Rural District during August. It appeared probable that these cases served as a reservoir from which infection subsequently overflowed into the more strictly controlled urban areas.

Primary Cases.

By Nationality :—

British...	...	...	...	...	...	...	...	...	95
Other foreigners	...	...	...	...	...	...	...	...	5
Sudanese	...	...	...	...	...	...	...	...	114
									<hr/> 214

By Age.

Age periods	0-1	1-5	5-15	15-25	25-35	35-45	45-55	55-65	Over 65
Cases	2	12	23	89	68	15	3	1	1

Types of Parasite.

Malignant Tertian	...	...	...	...	...	...	...	163
Benign Tertian	...	...	...	...	...	...	...	35
M.T. and B.T.	...	...	...	...	...	...	...	1
Clinical	...	...	...	...	...	...	...	15

Cases amongst British Troops.

Of the primary cases infected in the three towns 80 occurred amongst British Troops. 6 cases contracted the infection in the Rural District. There were 14 imported and 15 relapsed cases.

Anti-larval measures.

The total number of mosquito infections found during the year was 10,428. a decrease of 2,054 compared with 1935.

The total cost of anti-mosquito work during the year was £E. 3,958 of which £E. 2,752 was expended on labour and £E. 1,205 on larvicides.

TUBERCULOSIS.

95 cases of pulmonary tuberculosis and 48 cases of non-pulmonary tuberculosis were notified during the year. Infections probably contracted within the province showed a decrease of 12 in the number of cases of pulmonary tuberculosis and a decrease of 8 in the number of cases of non-pulmonary tuberculosis. There was an increase of 3 and a decrease of 5 in the imported cases of pulmonary and non-pulmonary tuberculosis respectively.

Cases by Sex.

						Pulmonary	Non-pulmonary.
Male	...	...	...	...	...	69	28
Female	...	...	...	...	...	26	20
TOTAL						95	48

Cases by Nationality.

Abyssinian	...	...	...	...	...	4	—
British	...	...	...	...	...	1	1
Syrian	...	...	...	...	...	1	—
Yemeni	...	...	...	...	...	1	—
Fellata	...	...	...	...	...	1	—
Indian	...	...	...	...	...	—	1
Sudanese	...	...	...	...	...	87	46
TOTAL						95	48

Age Incidence.

Age periods.		0-5	5-15	15-25	25-35	35-45	45-55	55-65	Over 65
Cases.		<hr/>							
Pulmonary	...	...	—	—	26	32	23	10	2
Non-pulmonary	...	3	8	12	11	8	3	2	1

Imported cases. Probable place of infection.

PLACE.				Pulmonary.	Non-pulmonary.	Total.
				<hr/>	<hr/>	<hr/>
Blue Nile Province	...	...		15	10	25
White Nile Province	...	...		6	—	6
Kordofan Province	...	...		6	—	6
Egypt	...	...	...	5	1	6
Kassala Province	...	...		5	—	5
Dongola (Northern Province)	...			3	—	3
Berber (Northern Province)	...			1	—	1
Equatoria	...	...	...	—	1	1
Abyssinia	...	...	...	1	—	1
India	...	...	...	1	—	1
Unknown	...	...	...	1	—	1
TOTAL				<hr/>	<hr/>	<hr/>
				44	12	56

Cases by Occupation.

OCCUPATION.	Pulmonary	Non-pulmonary.	Total.
Merchants, shopkeepers, minor crafts-			
men	14	7	21
Servants, cooks, etc. ...	12	3	15
Labourers	9	2	11
Cultivators	8	2	10
Clerical	7	—	7
Soldiers, police, orderlies	4	1	5
Tumergi	1	—	1
Other occupations ...	2	1	3
Indigent, unemployed	12	5	17
Women	26	16	42
Children under 15 ...	—	11	11
	95	48	143

The following table shows the disposal of cases notified during the year :—

	Pulmonary	Non-pulmonary.	Total.
Died	32	8	40
Left the Province ...	26	5	31
Still in hospital ...	17	17	34
Still in Province ...	19	17	36
Untraced	1	1	2
	95	48	143

The following table shows the result of a follow-up of 534 cases of pulmonary tuberculosis notified from 1930 to 1935 :—

YEAR.	No. of Cases.	Died.	Condition in December, 1936.			Total
			Left District.	Alive in District.	Untraced	
1930	82	47	28	3	4	82
1931	69	37	23	2	7	69
1932	96	59	25	7	5	96
1933	100	58	30	9	3	100
1934	83	45	29	5	4	83
1935	104	44	28	28	4	104
TOTAL ...	534	290	163	54	27	534

Of 95 cases of pulmonary tuberculosis notified during 1936, 33.7% are known to have died during the year. It is not always possible to keep trace of all cases which leave the province as many of them may return to homes remote from a medical centre. It is probable that a proportion of such cases have died and that the real mortality rate in the years of notification is considerably higher than 33.7%.

The known mortality rate in 534 cases notified during the preceeding six years is 54.3 %. Again it is almost certain that the real mortality rate over this period is considerably greater than this figure. The known survival rate is only 10.1 %.

The following table shows the result of a follow-up of 231 cases of non-pulmonary tuberculosis notified from 1932 to 1935 :—

YEAR.	No. of Cases.	Died.	Condition in December, 1936.			Total
			Left District.	Alive in District.	Untraced	
1932	36	9	11	12	4	36
1933	76	18	19	28	11	76
1934	58	17	19	16	6	58
1935	61	14	14	31	2	61
TOTAL ...	231	58	63	87	23	231

The known mortality rate over this period is 25.1 %. The known survival rate is 37.7 %.

During 1936 the known mortality rate of non-pulmonary tuberculosis was 16.7 %.

SMALLPOX AND VACCINATION.

No case of smallpox was reported during the year. 4,079 vaccinations were performed during the year.

RABIES.

5 cases of animal rabies were confirmed during the year. Other suspected cases were reported, but it was not possible to obtain the animal sufficiently early to carry out microscopical examination of the brain. In all such instances prophylactic inoculation was performed.

Two cases of human hydrophobia occurred. In each case neither patient had reported for treatment after being bitten. In each case death followed apparently about four months after the bite.

KHARTOUM NORTH CIVIL HOSPITAL.

The dispensary at Khartoum North was converted to a dieted hospital of 40 beds at the beginning of the year.

Inpatients during the year numbered 952, an increase of 107 compared with the previous year. 22 deaths occurred amongst inpatients, of which 9 were due to cerebrospinal meningitis.

Outpatient attendances decreased by 8,685 ; 48,982 patients being seen against 57,667 in 1935.

RURAL DISTRICT DISPENSARIES.

The following table shows attendances at these dispensaries during the past two years :—

DISPENSARY.	1935	1936
Geili	7,384	13,849
Khileila	9,453	8,835
Gordon's Tree	9,087	10,744
Sururab West	7,990	14,200
Gereif East	10,320	11,112
Tuti Island	17,886	21,614
Deim Abu Saed	24,349	18,221
Ailafoun	12,728	11,865
Gereif West (opened 21.7.36)	—	5,661
	99,197	116,191

During the year the officials in charge of dispensaries carried out regular tours throughout their districts. Patients seen on such tours are not included in the above list.

KHARTOUM NORTH CENTRAL PRISON.

The average daily strength of prisoners of all categories was 426.

The health of the prisoners has been satisfactory and there was no outbreak of epidemic disease. No case of cerebrospinal meningitis occurred in the prison. 113 in-patients received treatment in the prison dispensary during the year, compared with 89 in 1935. The number of outpatient attendances fell from 35,295 in 1935 to 31,452 in 1936. These figures include attendances by members of the prison staff and their families. 2 deaths occurred in the prison dispensary during the year, 1 from uraemia and 1 from cancer of the liver with metastases in the lungs.

85 prisoners from the district prisons were admitted to a separate block of the prison for treatment. 2 deaths occurred amongst these admissions.

An investigation into the adequacy of the prison diet was carried out. The results obtained indicated that the diet was generally sufficient.

Juvenile delinquents are now accommodated in a separate reformatory. The changed mode of life has reacted favourably on both their physical and mental well-being.

SCHOOL MEDICAL SERVICE.

It was possible to increase somewhat the work of this service. 19 schools were inspected and 2,814 pupils were examined. 1,564 were referred for treatment, a great proportion of whom were suffering from eye diseases. The general standard of health amongst the school children was satisfactory and there was no evidence of malnutrition.

The following table shows a summary of the results of school medical inspection during the past two years:—

	1935	%	1936	%
Number of pupils examined... ..	2,460	—	2,814	—
Number referred for treatment ...	1,466	59.6	1,564	55.6
Trachoma (active)	1,120	45.5	1,055	37.5
Defective vision	245	—	233	—
Dental disease	245	9.96	267	9.5
Albuminuria	43	—	160	—
Splenomegaly	13	—	53	—
Diseases of the ear, nose and throat	32	—	64	—
Cardiac defects	30	—	26	—
Pulmonary disease (non-tuberculous)	3	—	9	—
Physical defects	33	—	21	—
Skin disease	—	—	24	—
Other conditions	29	—	8	—
Not vaccinated	—	—	53	—

It was not practicable nor profitable to undertake accurate vision testing in the junior schools. The staff of the Government Ophthalmic Surgeon is quite inadequate to cope with the number of refractions which would thereby be referred to him. Furthermore, even were it possible to prescribe glasses for the younger pupils it is impossible to persuade their parents to buy them or the children to wear them. The 233 cases of defective vision in the above table refer to only 1,250 of the total pupils examined—a percentage of 18.7.

The decreased incidence of active trachoma is satisfactory, but a better picture of the effectiveness of routine treatment of this disease is given by figures taken from the Gordon Memorial College. In the junior schools there is a constant influx and efflux of new pupils to and from every class each year.

In the Gordon Memorial College new entry is received only into the first year class and it is possible to exercise a full degree of medical supervision over each pupil during the period of his education in the College. The present system of the treatment of trachoma on the school premises by trained orderlies was commenced late in 1932. The following table shows the percentage incidence of active trachoma amongst the pupils of the College since that year :—

Year.							% of active trachoma
1932	...	...	...	...	...	...	82.8
1933	...	...	...	...	...	...	60.8
1934	...	...	...	...	...	...	47.8
1935	...	...	...	...	...	...	23.6
1936	...	...	...	...	...	...	21.7

MERCURIALISM.

During 1935 and the early part of 1936 a number of cases, some fatal, of mercury poisoning occurred in Omdurman. The cases were scattered and no connection could be traced between them. Police authorities were satisfied that there was no suspicion of criminal poisoning.

Several lines of investigation were followed, but with negative results.

In January 1936 a man died with symptoms suggestive of acute irritant poisoning. Mercury was recovered from his organs. It was elicited that he had been treating himself for gonorrhoea with intra-urethral instillations of native butter (semn). A sample of the semn used was obtained and proved to be contaminated with mercury.

Samples of semn from all parts of the country were analysed. In certain samples mercury was found, usually in small amounts. It appeared from the results of numerous analyses that all contaminated semn had originated from the western Sudan.

Further enquiry revealed the fact that drums which had contained Abavit had come into the hands of the semn producers. These drums were used for the process of clarification of the semn, but not generally for its transport or distribution.

Abavit is a preparation containing mercuric biniodide and mercuric perchloride and is used as a seed dressing. One Abavit drum, in the possession of a producer to whom contaminated semn was traced, was found still to contain traces of mercury.

Measures were at once taken to seize and destroy all empty Abavit drums. Semn producers were warned against their use. Subsequently a continued analysis of samples of semn was maintained. No further contamination has been found and no subsequent case of mercury poisoning has come to light.

METEOROLOGICAL OBSERVATIONS
AT
STACK MEDICAL RESEARCH LABORATORIES, KHARTOUM.
1936.

Month.	Temperature in Degrees Fahrenheit				Mean Relative Humidity % at 8 a.m.	Average Evaporation in m.m.	Rain in m.m.	Haboobs and sand storms	Prevailing Winds
	Highest Max.	Lowest Min.	Average Max.	Average Min.					
January ...	94.9	50.5	88.7	55.6	37	7.7	—	0	N.
February...	105.0	53.8	95.7	62.0	31	9.2	—	0	N—N N E.
March ...	110.6	55.0	103.9	68.2	23	12.0	—	1	N—NE.
April ...	113.0	61.0	106.4	74.3	22	13.7	—	2	N.
May ...	117.2	72.7	112.1	79.1	23	14.5	2.2	1	NNW—NNE
June ...	114.2	73.8	107.3	78.6	39	13.8	3.5	8	SSW.
July ...	108.6	71.4	100.6	76.8	58	10.8	18.4	10	SSW.
August ...	105.8	67.1	95.9	75.4	69	7.2	84.5	7	S—SW.
September	108.5	70.9	101.8	77.3	55	10.3	9.8	5	S—SW.
October ...	109.4	72.3	105.6	76.1	41	10.7	4.3	3	N.
November	105.6	62.0	101.3	68.4	35	9.3	—	0	N—NE.
December	103.9	49.4	92.7	62.3	38	8.6	—	5	NNW.

JEBEL AULIA DAM.

During the first half of the year there were approximately 4000 labourers and staff employed on the Dam construction. As in previous years work closed down during the rainy season, by which time the solid masonry Dam was completed. On resumption in late October the total employed was approximately 2000—of these 750 were Saidis and 1250 Sudanese. This number sufficed to carry the work through to its termination.

On the whole the health of the labourers and staff was satisfactory. Admissions to hospital averaged 3.2 daily.

With the exception of a small outbreak of cerebrospinal meningitis in April and May, no serious epidemic occurred. The total number of cases notified was 32 with a mortality rate of 62%. In anticipation of a possible outbreak precautions were taken early and special attention paid to the spacing and housing of labourers. These measures together with the control of labourers coming from infected areas undoubtedly assisted in keeping the outbreak within bounds. It is interesting to note that of a total of 117 cases occurring in the three years of work only one case occurred amongst the Saidis.

In view of the fact that the labourers are recruited from a variety of sources and that the population is necessarily concentrated in a localised area it is satisfactory to note that the incidence of fly borne disease has been maintained again at a low level. 44 cases of dysentery occurred as compared with 50 last year. 43 of these were amoebic dysentery, all of which proved mild infections. The carrier rate was high; of 319 routine examination of stools, 134 were positive for *Entamoeba histolytica*, 9 for *Entamoeba coli*.

Three cases of paratyphoid fever occurred during the year. All were considered to have been contracted outside the colony.

The incidence of malaria remained low.

Six cases of bilharzia were treated in hospital as compared with 83 last year. All were relapses of old infections.

Routine examination of stools of Saidis revealed an infection rate for ankylostomiasis of 20%. Only 11 cases required hospital treatment.

The systems of conservancy and refuse disposal were similar to those of previous years and continued to function satisfactorily.

The water supply for the colony is from a 24,000 gallon tank treated by the Patterson process. Provision for the Saidi camp is by means of a 100,000 gallon reservoir which is treated thrice daily with chlorosene and ammonium chloride. Repeated tests have shown water from both sources to be of a potable standard.

(b) BLUE NILE PROVINCE.

Apart from an epidemic of cerebrospinal meningitis the health of the Province was satisfactory.

The rains were heavy and malaria showed an increase in the Wad Medani area but no great change was evident in the outside districts.

The situation regarding the incidence of bilharzia in Blue Nile natives remains satisfactory and there is no evidence that the disease is making headway in the irrigated areas.

Economic conditions were good and the standard of nutrition of the native was better than that of last year.

It is satisfactorily to note a further fall in the cases of dysentery. The following table shows the figures for the last six years :—

1931	...	..	...	261	1934	...	...	...	131
1932	...	...	...	185	1935	...	...	...	93
1933	...	...	...	168	1936	...	...	...	62

There were two cases of enteric fever with no deaths.

GEZIRA IRRIGATION SCHEME. Public health measures in the Gezira are directed towards two main objectives :—

(a) The control of mosquito breeding.

(b) The protection of water supplies .

The Control of Mosquito Breeding.

The control of mosquito breeding in an area of cotton cultivation and perennial watering is a question of the utmost importance. The chief method of control is by baling water channels until dry. In the old cotton area and during the dry season this method is satisfactory but difficulties arise during the rains and in the baling of the smaller channels in new extensions. During the rainy season, wholesale oiling of cotton blocks was attempted. The results were disappointing and did not justify the expense involved. The method of pouring oil on water channels suffers from the great disadvantage that the film is at the mercy of the wind and tends to collect in one place. An attempt

to oil by a method of seepage is to be made during this period in 1937. Pieces of sacking soaked in oil, are attached to metal rods and placed in series in the bottom of the channel. A constant film of oil is thus obtained.

The large number of natural depressions which exist in this area are a constant source of trouble and danger during the rains. Drainage is the only solution and it is hoped that this method will be used on a large scale during 1937. In the past many tons of oil have been used on these areas, but when overgrown with weeds, oiling is not satisfactory. Next year it is intended to treat all such areas with Paris green which in addition to being more effective is likely to result in a considerable saving in expenditure.

Protection of the Water Supply. The native habit of defaecating near water is a difficult one to stop. Bearing in mind the great danger of the spread of bilharziasis, strict measures are taken to prevent access to canals except for obtaining drinking water. Latrines are provided all over the cultivated area and in schools but the extent to which they are used is disappointing.

The policy of the removal and siting of villages at least 300 metres from canals and the provision of village wells has been continued. These measures undoubtedly assist in reducing the danger of pollution, but even where this has been done, the temptation to make use of the easier though more distant canal water is great, and it remains to be seen to what extent the wells will be used.

A new method will be tried in 1937. Water is to be piped through the canal bank and delivered to a tank 20 metres from the canal. The canal will be wired or fenced for a sufficient distance to make access difficult.

Following on the annual bilharzia survey all canals in the neighbourhood of villages where cases have been found are disinfected. Molluscs were present in these canals before disinfection. None were found alive after disinfection and they did not reappear for 3 months.

WAD MEDANI.

Population 33,000.

The sanitation of the town has been carried out on the same lines as last year.

The public pit latrines installed during recent years have proved a success but those in private compounds are less satisfactory. In many instances the size of the compound does not allow of a sufficient space for resiting when a new pit is required.

The system of refuse disposal practised hitherto has been to fill up low lying areas in the vicinity of the town. This unsatisfactory method has been discontinued as there are no more sites and a scheme is now under consideration for vehicles and a light railway to convey refuse to a dump in the conservancy area.

There has been a noticeable fall in the incidence of dysentery but there is still room for improvement. Efforts in this direction are concentrated mainly on the control of animals, the removal of refuse and the provision of latrines.

(c) NORTHERN PROVINCE.

The general health and condition of the people has been good.

There is a steady increase in the population, and the number of new buildings which have appeared during the year in the towns and outlying districts is evidence of increased prosperity.

In common with other parts of the northern Sudan small outbreaks of cerebrospinal meningitis occurred throughout the Province.

The incidence of malaria in the southern districts was approximately the same as in other years but in the Merowe and Dongola areas the disease assumed almost epidemic proportions.

Factors contributing to this high incidence were the irregular fall of the river and the exceptionally large number of pools remaining on the foreshore, also the long period during which stagnant water stood in the irrigation channels and basins in the Dongola district.

Extra staff was trained to deal with the mosquito problem and quinine freely distributed throughout the district.

ATBARA

Population 20,000.

It is satisfactory to note a further decrease in the cases of dysentery : 56 cases were admitted for treatment during the year as compared with 73 in 1934, and 93 in 1933.

A small outbreak of bacillary dysentery among the British Troops was traced to contact with a carrier returning from Egypt.

Two cases of enteric fever occurred ; the source of infection was not traced.

A single bucket system and daily trenching is the method of conservancy employed. Dry refuse is disposed of by firing and controlled tipping. These systems have proved reasonably effective.

Water Supply. Drinking water is obtained from the Nile and is sedimented and chlorinated but not filtered. Examination of samples shows the water to be of a high standard of potability.

(d) PORT SUDAN.

Population 20,772.

The health of the port and district has been good.

11 cases of diphtheria and 2 cases of cerebrospinal meningitis were notified during the year. Sporadic cases of chickenpox and enteric fever occurred from time to time.

Port Sudan in common with the rest of the Red Sea littoral is non-malarious and mosquito control is not a serious matter.

The most difficult sanitary problems of the town are the limitation of fly breeding and the disposal of sewage.

Conservancy.

Water borne systems. A few additions were made during the year. Septic tanks now total 52, cesspits with water closet connections 66.

The septic tank system is eminently suited to conditions prevailing at Port Sudan. Owing to the brackish nature of the subsoil water no wells are used for drinking water and the extension of the system is limited only by the amount of space available for installations, and by the quantity of water available for flushing. Percolation through the coral is slow, and in the case of public latrines, it is necessary to install a number of effluent pits to avoid overloading. In congested areas effluent pits have to be pumped out from time to time.

Installations in private houses operate without trouble and it is hoped to increase their number considerably during the coming year.

Bucket latrines. The remainder of the town is served by a double bucket system. Pit latrines have been tried but, owing to high level of the subsoil water, have not proved successful.

Provision of some form of conservancy for the extensive native lodging areas round Port Sudan is under consideration.

Mosquitoes.

The pools of seeped sea water in the low lying parts of the harbour have been infected with culex and anopheline larvae. In December it was found that native sambuks were responsible for introducing mosquitoes into the harbour.

Of 245 infections found during the year, 124 were culex, 112 aedes and 9 anopheline.

Rats.

Every effort is made to keep the rat population at a low level. Warehouses are as far as possible rat-proofed or made unsuitable to the harbourage of rats. Precautions are taken to prevent any food or drink being available for rats in the vicinity of the quays.

Communication with ships is adequately guarded against.

The total number of rats caught during the past five years is as follows :—

1932	1933	1934	1935	1936
———	———	———	———	———
6,885	6,454	6,705	6,134	5,302

Of the 5302 rats caught this year :—

21.2% were *Rattus Rattus*.

18.8% were *Rattus Rattus Alexandrinus*.

60.0% were *Rattus Rattus Frugivorous*.

Rat Fleas.

The flea census per month together with prevailing atmospheric conditions was as follows :—

MONTH.	Fleas per rat.	Average Temperature Shade.		Average Relative Humidity.
		Maximum °C.	Minimum °C.	
January	1.2	—	—	—
February	1.2	13.0	15.3	69.3
March	1.3	—	—	—
April	1.4	37.8	17.8	58.9
May	1.3	41.0	18.3	51.5
June	1.4	44.7	22.4	36.7
July	1.2	44.8	24.8	46.2
August	1.6	44.7	26.8	56.5
September	1.2	42.9	23.7	74.7
October	2.0	39.1	20.8	74.2
November	2.3	33.4	20.0	72.2
December	1.2	31.8	15.5	71.2

Water Supply.

The quality of the water supply from Khor Arbaat continues satisfactory, and the quantity ample for immediate needs.

VITAL STATISTICS.

Population. The following tables give the area and approximate population of the provinces of the Sudan.

The population figures, even in the northern provinces, can only be regarded as a rough estimate, and are of a very limited value in the determination of birth and death rates.

There is little doubt that the population is increasing rapidly, as evidenced by the swarms of children seen in all towns and villages, but at present no machinery exists whereby accurate statistics can be obtained.

Hitherto the incidence of disease and the mortality rate have been based on admissions and deaths in hospitals and by the number of attendances at outpatient departments and dispensaries. Arrangements have now been made for recording each new case attending for treatment. Thus a more accurate picture of the relative morbidity of diseases in various provinces will be obtained:—

PROVINCE.	Square Miles.				Approx. Population.
Blue Nile	43,900	809,599
Darfur	137,900	751,528
Equatorial	151,800	1,051,059
Kassala	140,606	409,355
Khartoum	5,700	267,183
Kordofan	146,800	1,222,729
Northern	234,400	508,030
Upper Nile	92,200	536,647
White Nile	16,300	388,347
				969,600	5,944,477

NON-EUROPEAN VITAL STATISTICS.

PROVINCE.	1933		1934		1935		1936	
	Total.	Rate.	Total.	Rate.	Total.	Rate.	Total	Rate.
Khartoum :—								
Births	5147	20.4	4013	16.2	4156	15.2	4223	15.8
Deaths	2857	11.3	2470	9.9	2087	7.6	2650	9.9
Still-births ...	130	25.2	129	32.1	142	34.1	118	27.9
Infantile mortality	428	83.1	298	74.2	234	56.3	265	62.7
Berber District :—								
Births	6606	37.7	3830	22.7	3881	20.5	3837	20.3
Deaths	4031	23.0	2385	14.1	1746	9.2	1925	10.2
Still-births ...	126	19.1	48	12.5	66	17.0	116	30.2
Infantile mortality	565	85.5	257	67.1	165	42.5	205	53.4
Dongola District :—								
Births	6187	33.0	5118	32.4	5056	26.3	5024	26.2
Deaths	3050	16.2	2334	14.7	2525	13.1	2550	13.2
Still-births ...	268	43.3	205	40.0	246	48.6	156	31.0
Infantile mortality	581	93.9	270	52.8	257	50.8	232	46.1
Blue Nile District :—								
Births	5647	11.1	6558	13.2	6638	16.1	4806	11.6
Deaths	4106	8.1	3958	8.0	3379	8.1	3253	7.8
Still-births ...	98	17.3	60	9.1	69	10.3	81	16.8
Infantile mortality	430	76.1	390	59.4	188	28.3	164	34.1
Wadi Halfa District :—								
Births	765	11.9	816	13.4	796	12.1	1253	18.9
Deaths	567	8.8	628	10.3	422	6.3	624	9.4
Still-births ...	14	18.3	14	17.1	39	48.9	28	22.3
Infantile mortality	163	213.0	127	155.6	60	75.3	73	58.2

The following table shows the births, deaths by ages and still-births of Khartoum Province and Blue Nile Provinces, Berber, Blue Nile and Dongola Districts and of Wadi Halfa District which are considered to be approximately correct.

NATIONALITY.	Births.		Deaths by ages.							Total deaths.		Total still births	
	Male.	Female.	Under 1 year	1-5	5-10	10-20	20-40	40-60	Over 60	Male	Female	Male	Female
British	1	—	—	—	—	—	12	3	—	15	—	—	—
Greek	6	7	—	—	—	—	—	3	5	7	1	1	—
Other Europeans	5	7	2	—	—	—	1	2	1	5	1	—	—
Egyptians & Syrians	150	117	17	14	3	2	4	6	11	34	23	5	2
Sudanese	9439	9086	891	1459	628	875	2273	1711	2669	5414	5092	271	218
All others	209	142	31	50	24	20	107	97	101	280	159	1	2
Total	9810	9359	941	1523	655	906	2397	1822	2787	5755	5276	278	222
Grand Total...	19169					11031				11031		500	
% deaths by ages..			8.5	13.8	6.0	8.2	21.7	16.5	25.3				

MATERNITY AND CHILD WELFARE.

MIDWIVES.

The school of midwifery at Omdurman continues to carry out excellent work. 25 pupil midwives completed the course of training and passed the qualifying examination. 5 trained midwives attended a revision course.

The school was opened 16 years ago and 269 midwives have been trained. Of these, 224 are still in practice. In view of the difficulty the school authorities experienced at its commencement in obtaining candidates, owing to local prejudice and opposition, it is satisfactory to note that in 1936 four pupil midwives paid £E. 5 each to be allowed to take the course.

The distribution of midwives is as follows :—

Khartoum Province	...	...	64	Blue Nile Province	...	...	32
Kordofan	„	...	24	Kassala	„	...	19
Darfur	„	...	5	White Nile	„	...	9
Northern	„	...	68	Upper Nile	„	...	3

The confidence in medical work inspired by the school is such that there is now a considerable demand for Sudanese women to be delivered in hospital. During the past year 61 and 107 labour cases, were admitted to Khartoum and Omdurman Civil Hospitals respectively. Many of these cases were normal deliveries.

In Khartoum North, Khartoum and Omdurman every delivery is attended by a licensed midwife and each pupil midwife attends 20 cases under supervision. During six months in Omdurman district a total of 952 cases were conducted by the school and the district midwives. Of these, 222 were abnormal deliveries. There were two deaths and 20 cases were transferred to hospital.

The Inspectress and Matron of the School make annual tours in the provinces for the inspection of midwives practising and for the recruitment of suitable candidates for training. Great care is taken to obtain the right type of woman, and each candidate must be selected from the locality in which it is intended she shall practise.

In addition to the teaching of midwifery the course of training at Omdurman includes instruction in child welfare and simple hygiene. Thus on returning to her practice the midwife becomes the channel through which these principles are introduced into the heart of village life. By these means a real advance in the progress of preventive medicine in rural areas has already taken place.

It is considered that the stage has now been reached when it is possible and desirable to supplement the work of the school in Omdurman. It is intended shortly to open a small subsidiary centre at Juba in the southern Sudan which is yet untouched owing to its distance from Khartoum.

A cadre of staff midwives in excess of requirements of the school is being trained and one will be posted to each province or important district as soon as they are available in order that the supervisory work can be decentralised.

They will exercise a continual supervision over the midwives in their areas, check their work and equipment and will be responsible to the Medical Inspector in charge.

MATERNAL MORTALITY.

The following statistics, relating to maternal mortality and the complications of child birth, are compiled from the returns of the Civil and Church Missionary Society hospitals in Omdurman, from the Midwifery Training School and the trained town midwives of Omdurman.

From the latter source figures for the first half of the year only are available.

These figures cannot be taken as typical of the whole of the northern Sudan, but they give some indication of the risk associated with pregnancy and parturition, conducted under the best available conditions.

Total Cases	...	...	...	...	...	...	...	1,109
Abnormal	...	...	...	...	...	...	...	309
Died	...	...	...	...	...	...	...	11
Births	...	...	...	...	...	...	...	1,018
Alive	...	...	...	...	...	...	...	977
Still-born	...	...	...	...	...	...	...	41

Complications and Cause of Death.					Total.	Recovered.	Died.
Abortions	...	{	Septic	...	6		
			Others	...	68		
					74	73	1
Puerperal sepsis	...	{	Normal labour	...	6		
			Abnormal labour	...	7		
					13	10	3
Puerperal haemorrhage	{		Placenta praevia	...	18		
			Other causes	...	29		
					47	—	2
Puerperal albuminuria and convulsions	...				4	3	1
Other toxæmias of pregnancy	...				6	6	—
Phlegmasia alba dolens	...				—	—	—
Embolism	...				—	—	—
Other accidents and abnormal conditions, of the puerperal state					146	144	2
Illness complicating, but not directly due to pregnancy					46	44	2

INFANT MORTALITY.

The infant mortality for the three towns—Khartoum, Khartoum North and Omdurman was 70.3 per thousand.

The following tables are the result of an analysis of 297 infant deaths and 337 deaths in children aged from 1 to 5 years:—

Infant Deaths (0-1 year).

CAUSE OF DEATH.	No. of Deaths.	Percentage of Total.
Congenital defects, prematurity, malnutrition	88	29.63
Diarrhoea, enteritis, dysentery	77	25.93
Pneumonia and bronchitis	62	20.85
Fever, malaria	23	7.74
Cerebrospinal meningitis	23	7.74
Syphilis	11	3.74
Septic conditions	8	2.69
Unnatural causes...	5	1.68
TOTAL	297	100.00

Deaths in Childhood (1-5 years).

					No. of Deaths.	Percentage of Total.
Diarrhoea, enteritis, dysentery	...	...	...	...	137	40.65
Pneumonia and bronchitis	...	...	...	...	66	19.58
Cerebrospinal meningitis	...	...	...	...	49	14.54
Fever, malaria	...	...	...	...	42	12.46
Unnatural causes	...	...	...	...	16	4.75
Congenital defects, malnutrition	...	...	...	...	10	2.97
Genito-urinary disease	...	...	...	...	4	1.19
Enteric fever	...	...	...	...	2	0.59
Diphtheria	...	...	...	...	2	0.59
Septic conditions	...	...	...	...	2	0.59
Other causes	...	...	...	...	7	2.08
TOTAL :					337	

In many of the cases considered above the cause of death was certified by officials not possessed of a complete medical education. In some cases the body was not seen until after death and certification of the cause of death depended entirely on the history obtained from the relatives.

The main causes of infant deaths are similar to those in England, though the group comprising congenital defects, prematurity and malnutrition is usually third on the English list. Two causes of death in the above list, fever, which is probably malaria, and cerebrospinal meningitis, do not usually figure in infant mortality rates in England.

MATERNITY AND CHILD WELFARE CLINICS.

These centres continue to do most valuable work. There is no doubt that they are highly appreciated by all classes of the native population.

In Khartoum Province there were 9,085 attendances—an increase of 1,168 over the number in the previous year. Of these attendances 2,926 were new cases. It is apparent that the majority of pregnant women within reach of the clinics make one or more visits.

The ante-natal clinic opened in Atbara Town in 1933 shows a steady increase in attendances :—

					1934	1935	1936
First attendance	...	...	...	...	135	162	206
Return attendances	...	...	...	...	61	55	78

Clinics have been opened in most towns in the northern Sudan to supplement the work already carried out at the local hospitals.

SCHOOL MEDICAL SERVICE.

The work of the School Medical Service has been extended in most provinces of the northern Sudan.

The major cause of disability in the North is trachoma, malaria in the South.

This year more attention has been paid to village schools especially with a view to the earlier treatment of trachoma and other eye conditions.

With these exceptions the standard of health of school children is satisfactory and there is little evidence of malnutrition.

21,041 children were examined during the year and the necessary treatment carried out. No case of pulmonary tuberculosis was discovered.

The following table shows the results of the examinations :—

PROVINCE AND DISTRICT	No. Examined	% Trachoma	% Bilharzia	% Spleen	% Pulm T.B.	% Ankylost
Blue Nile Province :—						
BLUE NILE DISTRICT.						
2 Intermediate ...	158	14.0	0.6	8.0	—	—
1 Greek School ...	38	—	—	2.0	—	—
3 Girls Schools ...	394	17.0	—	5.0	—	—
4 Elementary ...	883	4.3	—	15.0	—	—
17 Village ...	3,383	15.0	0.2	20.0	—	—
FUNG DISTRICT.						
6 Elementary ...	572	28.0	1.0	41.0	—	—
2 Girls Schools ...	83	66.0	8.0	78.0	—	—
4 Village ...	220	37.0	0.4	51.0	—	—
Darfur Province :—						
2 Elementary ...	394	56.0	31.0	36.0	—	—
4 Village ...	348	70.0	34.0	35.0	—	—
Equatorial Province :—						
JUBA DISTRICT.						
2 Intermediate ...	178	6.0	1.0	16.0	—	2.0
2 Elementary ...	170	4.0	1.0	30.0	—	2.0
WAU DISTRICT.						
2 Girls Schools ...	22	4.0	—	4.0	—	—
8 Boys Schools ...	621	6.0	1.0	19.6	—	6.0
Kassala Province :—						
KASSALA DISTRICT.						
2 Elementary ...	326	47.0	—	16.6	—	—
45 Village ...	2,037	46.0	—	24.8	—	—
PORT SUDAN						
1 Primary ...	85	44.0	4.0	3.0	—	—
2 Elementary ...	330	10.0	—	0.6	—	—
1 Village ...	15	73.0	2.0	13.0	—	—

Medical Examinations of Schools.—(Contd.)

PROVINCE AND DISTRICT	No. Examined	% Trachoma	% Bilharzia	% Spleen	% Pulm T.B.	% Ankylost
Khartoum Province :—						
Gordon College	290	21.7	—	0.34	—	—
Technical School	119	42.9	—	—	—	—
3 Intermediate ...	486	22.8	—	0.41	—	—
12 Elementary ...	1,561	41.8	—	2.6	—	—
1 Village ...	304	57.9	—	3.3	—	—
Unity High School ...	54	1.8	—	—	—	—
Kordofan Province :—						
1 Intermediate ...	11	18.0	—	27.0	—	—
14 Elementary ...	1,235	14.4	17.5	43.0	—	—
23 Village ...	575	15.4	8.5	36.0	—	—
Northern Province :—						
WADI HALFA DISTRICT.						
1 Intermediate ...	61	52.4	21.3	1.0	—	4.9
3 Elementary ...	280	56.0	19.0	0.7	—	0.7
1 Village ...	111	50.4	27.0	0.9	—	—
1 Girls School ...	55	50.9	7.0	—	—	—
DONGOLA DISTRICT.						
4 Elementary ...	650	60.4	4.3	21.0	—	—
2 Girls Schools ...	120	55.0	0.8	15.0	—	—
5 Village ...	429	58.9	2.0	7.0	—	—
BERBER DISTRICT.						
2 Intermediate ...	146	62.3	—	5.5	—	—
1 Technical ...	69	44.0	—	11.6	—	—
1 Girls School ...	62	61.2	—	12.9	—	—
5 Elementary ...	893	61.0	0.8	8.8	—	—
37 Village ...	1,632	67.0	8.0	16.8	—	—
Upper Nile Province :—						
1 Elementary ...	103	33.0	1.9	36.0	—	0.9
5 Village ...	190	14.2	—	12.0	—	3.1
White Nile Province :—						
Teachers Train- ing College	62	61.2	3.2	12.9	—	—
1 Intermediate ...	23	91.3	30.0	17.0	—	—
2 Girls Scools	100	54.0	—	5.0	—	—
8 Elementary ...	687	40.0	13.6	35.0	—	—
15 Village ...	476	39.0	19.9	46.0	—	—

QUARANTINE.

(a) PORT SUDAN QUARANTINE.

Quarantine restrictions for cholera were enforced against Siam from February and against Ceylon from April until the end of the year. Restrictions for smallpox were enforced against Bombay from March until the end of the year and against Karachi from March until November. Restrictions for plague were enforced against Karachi from March until the end of the year.

The following table shows the number of ships entering the port during the last six years:—

	1931	1932	1933	1934	1935	1936
Ships arriving	888	808	778	886	1181	1148
Sailing Vessels	530	546	423	509	435	427
Warships British	18	7	14	15	60	24
„ French	4	2	6	6	3	5
„ Italian	4	—	—	1	3	—
Persons isolated from ships ...	—	—	1	7	8	3

Ships Quarantined.

No ships were quarantined during the year. A ship arrived in April from Calcutta with a member of the crew suffering from smallpox. The patient was disembarked, the crew and dock labourers vaccinated and the quarters of the sick disinfected. Free pratique was granted after the necessary quarantine measures had been carried out.

Persons isolated from ships.

Three persons were isolated from ships during the year, one suffering from smallpox, and one from cerebrospinal meningitis. The third was a contact of the latter case.

Deaths on board ships.

Several deaths occurred on board ship, the majority outside the port. None was due to a quarantinable disease.

(b) SUAKIN QUARANTINE.

The number of pilgrims leaving Suakin showed a marked increase.

The figures for the last six years are as follows:—

1931	...	...	...	2414	1934	...	...	...	1459
1932	...	...	...	1348	1935	...	...	...	1672
1933	...	...	...	970	1936	...	...	...	3404

The increase was mostly among pilgrims from West Africa and is to be accounted for partly by improved economic conditions, partly owing to restricted traffic through Massawa.

All pilgrims were vaccinated and received one inoculation against cholera before departure.

They paid in advance their return steamship fare and the quarantine charges in the Hedjaz and at Suakin. 2,792 pilgrims passed through Suakin on their return. All these had departed from Suakin.

The general health of the pilgrims on the whole was satisfactory though there was a good deal of sickness amongst the earlier batches. Chickenpox and respiratory diseases were prevalent and six deaths occurred from lobar pneumonia. The latter were probably due to cold weather and rains in Saudi Arabia.

151 cases were admitted to hospital of whom 7 died.

Two cases of smallpox occurred among the second batch of pilgrims, one proved fatal. Owing to these cases and to reports from Jeddah that smallpox was prevalent, the quarantine period was extended at first to eight and later to fourteen days.

(c) WADI HALFA QUARANTINE.

1152 Egyptian labourers passed through the quarantine. None were repatriated as unfit. 66 were found to be infected with bilharzia and were treated either at Wadi Halfa or at their destination.

OPHTHALMIC REPORT

BY MR. A. R. MCKELVIE.

47 male beds were provided in the River Hospital and 20 female beds, total=67.

	River Hospital.	Omdurman Hospital.	Total.
Inpatients... ..	565	90	655
Outpatients attendances	23,318	32,367	55,685
Operations	644	90	734
New Cases	4,420	9,470	13,890

TRACHOMA.

The treatment carried out was practically the same as that described in the 1934 Annual Report, but for a short time experiments were carried out with quinine bisulphate alone.

The method was described by Selinger in the American Journal of Ophthalmology (July 1935). A saturated solution of quinine bisulphate (approx. 10%) is rubbed into the lids. Quinine bisulphate ointment (4%) is instilled afterwards.

Some cases seemed to respond very well but it was found that combining the quinine treatment with the others gave better results. Thus :

1st day ... 2% or 10% zinc sulphate.

2nd day ... 10% copper sulphate.

3rd day ... 10% quinine bisulphate.

4th day ... Chaulmoogra oil.

In the large coarse granulation stage it was found that finely powdered sodium chloride (gr. 2 per lid) applied by a rod wrapped in cotton wool and dipped in glycerin was still the best.

The other modification practised was the use of oxycyanide of mercury lotion (1:5000) for irrigation in preference to acid boric lotion with zinc sulphate.

CONJUNCTIVITIS.

An attempt is being made to assess the various forms of conjunctivitis, together with their seasonal incidence, as far as the River Hospital and Omdurman Civil Hospital are concerned. Unfortunately these figures only apply to a small proportion of the population of Khartoum area and do not give an idea of the true incidence.

RETINITIS PIGMENTOSA.

Five cases were admitted to hospital. Retrobulbar injections of acetylcholin were tried in one case but with very little improvement. Another case not so far advanced but also having a marked convergent strabismus was operated upon for correction of the squint and showed marked improvement of vision as a result.

OPTIC NERVE.

One case of quinine amblyopia was admitted to hospital and recovered without any apparent permanent damage.

TUMOURS.

Six cases were admitted to hospital. One, a carcinoma of the maxillary antrum, was admitted as an acute dacryocystitis abscess and was only recognised later. The patient eventually died.

RIVER HOSPITAL AS IN-PATIENTS DURING 1936.

DISEASE.										No. Cases.
Trachoma	...	...	...	...	...	...	...	...	...	67
Conjunctivitis	...	...	...	...	...	...	...	...	...	98
„ gonorrhoeal	...	...	...	...	...	...	...	...	...	17
Cataract	...	...	...	...	...	...	...	...	...	111
„ traumatic	...	...	...	...	...	...	...	...	...	7
„ congenital	...	...	...	...	...	...	...	...	...	2
„ secondary	...	...	...	...	...	...	...	...	...	4
Keratitis	...	...	...	...	...	...	...	...	...	12
„ interstitial	...	...	...	...	...	...	...	...	...	2
Perforated corneal ulcer	...	...	...	...	...	...	...	...	...	32
Corneal injury	...	...	...	...	...	...	...	...	...	12
Trichiasis	...	...	...	...	...	...	...	...	...	32
Adherent leucoma	...	...	...	...	...	...	...	...	...	30
Glaucoma	...	...	...	...	...	...	...	...	...	37
„ and cataract	...	...	...	...	...	...	...	...	...	17
Buphthalmos	...	...	...	...	...	...	...	...	...	1
Symblepharon	...	...	...	...	...	...	...	...	...	2
Dacryocystitis chronic	...	...	...	...	...	...	...	...	...	4
Retino-choroiditis	...	...	...	...	...	...	...	...	...	3
Retinitis pigmentosa	...	...	...	...	...	...	...	...	...	4
Detachment of the retina	...	...	...	...	...	...	...	...	...	1
Exophthalmos	...	...	...	...	...	...	...	...	...	1
Tumour of conjunctiva	...	...	...	...	...	...	...	...	...	1
Tumour of lid	...	...	...	...	...	...	...	...	...	1
Fibrolipoma of orbit	...	...	...	...	...	...	...	...	...	2
Carcinoma	...	...	...	...	...	...	...	...	...	1
Iridocyclitis and iritis	...	...	...	...	...	...	...	...	...	12
Injuries	...	...	...	...	...	...	...	...	...	9
Pterygium	...	...	...	...	...	...	...	...	...	3
Staphyloma	...	...	...	...	...	...	...	...	...	9
Chalazia	...	...	...	...	...	...	...	...	...	2
Strabismus	...	...	...	...	...	...	...	...	...	3
Panophthalmitis	...	...	...	...	...	...	...	...	...	5
Defective vision myopia	...	...	...	...	...	...	...	...	...	4
Defective vision hypermetropia	...	...	...	...	...	...	...	...	...	5
Blepharitis	...	...	...	...	...	...	...	...	...	3
Optic atrophy primary	...	...	...	...	...	...	...	...	...	0
„ „ secondary	...	...	...	...	...	...	...	...	...	2
Quinine amblyopia	...	...	...	...	...	...	...	...	...	1
Hypopyon	...	...	...	...	...	...	...	...	...	1
Post menigitic optic atrophy	...	...	...	...	...	...	...	...	...	2
Enucleation and insertion of glass eye	...	...	...	...	...	...	...	...	...	3
TOTAL										565

EYE OPERATIONS—RIVER HOSPITAL DURING 1936.

MONTH	Cataract	Glaucoma	Pterygium	Trichiasis and Entropion	Enucleation	Lachrymal Sac.	Trachoma	Electro Cautey	Needling	Strabismus	Tattoo	Simple Tumour	Carcinoma	Staphyloma	Plastic Operation	Minor Operations	TOTAL
January	13	14	3	4	—	—	—	—	1	2	1	1	1	—	—	29	69
February	12	7	2	6	1	—	—	1	1	—	—	1	—	—	3	18	52
March	03	1	3	5	—	—	2	—	—	—	—	—	—	—	—	11	25
April	13	8	5	11	1	1	1	2	1	—	3	—	—	—	2	12	60
May	22	5	3	12	1	1	—	4	2	2	2	1	—	—	3	14	72
June	06	3	1	03	—	—	—	2	1	—	—	—	—	—	1	23	40
July	04	5	2	10	—	1	3	6	1	—	—	1	—	—	—	11	44
August	12	7	—	05	—	—	2	1	1	—	—	—	—	2	1	27	58
September	05	4	1	10	1	—	1	6	—	—	—	1	—	—	3	33	65
October	12	8	8	04	—	—	—	2	2	—	—	1	—	1	—	29	67
November	09	6	1	03	1	1	—	1	2	—	4	1	—	—	—	24	53
December	8	5	2	4	—	—	—	—	1	—	2	—	—	2	—	15	39
GRAND TOTAL	119	73	31	77	5	4	9	25	13	4	12	7	1	5	13	246	644

TABLE SHOWING ATTENDANCES AT THE RIVER HOSPITAL EYE DEPARTMENT DURING 1936.

MONTH	Trachoma		Conjunctivitis		Cataract		Glaucoma		Lachrymal Sac.		Strabismus		Blepharitis		Foreign Bodies		Trichiasis		Hordeolum Meibomian Cysts		Pterygia		Adherent Leucoma		Refractions	Vision Tests for Medical Boards	Individual Cases	Attendances	Grand Total
	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	Individual Cases	Total Attendances	
January	56	488	47	386	28	251	20	143	4	32	1	4	34	193	13	55	10	56	11	56	11	59	4	34	44	128	411	1,929	
February	57	505	61	611	10	180	13	178	—	10	1	2	11	117	6	26	8	46	10	45	2	24	6	36	49	190	424	2,019	
March	50	501	35	521	8	220	4	109	—	9	—	1	8	30	6	30	6	41	13	54	3	35	—	—	9	50	192	1,610	
April	35	490	40	389	4	164	2	155	1	17	1	3	6	36	4	18	5	46	3	21	—	17	3	27	70	29	203	1,482	
May	38	467	34	431	20	266	11	142	12	54	2	14	6	82	6	36	7	53	5	26	6	37	3	25	76	90	316	1,799	
June	35	398	31	395	10	121	5	90	1	12	1	11	11	102	18	64	6	37	1	24	1	17	2	34	7	185	314	1,497	
July	40	454	37	492	11	112	7	55	1	14	—	2	12	74	8	40	11	48	2	24	2	12	3	47	8	90	232	1,472	
August	96	585	214	975	24	108	12	54	4	28	2	6	25	130	15	63	8	40	16	67	1	6	13	76	20	60	510	2,218	
September	100	703	232	1,122	30	150	37	125	6	52	5	17	62	234	25	90	35	120	37	92	30	70	7	44	74	40	720	2,933	
October	91	706	67	796	23	164	23	140	5	48	2	14	20	120	15	90	16	102	16	67	5	46	10	60	5	150	496	2,556	
November	61	676	65	590	16	287	9	79	—	—	—	—	8	51	11	37	7	36	10	40	5	38	4	28	45	60	301	1,966	
December	59	683	70	615	22	124	17	85	1	3	—	—	17	98	6	21	12	56	7	25	1	6	2	34	35	52	301	1,837	
Total Individual Cases	718		933		206		160		35		15		220		133		131		131		67		57		490	1,124	4,420		
Total Attendances		6,656		7,323		2,147		1,354		279		74		1,267		570		681		541		367		445		490	1,124		23,318

REPORT

OF

STACK MEDICAL RESEARCH LABORATORIES.

BY DR. E. S. HORGAN

RESEARCH.

MALARIA. Mosquito Survey in the Gezira.

This has been continued uninterruptedly through the year and has given some interesting results. A brief summary of the work done will be found in the entomological section of this report. Other research work carried out in the Laboratories will be found under the appropriate subject headings.

ROUTINE AND EDUCATIONAL ACTIVITIES.

Routine Examinations of Specimens.

A brief summary is appended at the end of the report. There was a considerable increase in the number of routine Kahn tests notwithstanding the fact that in Port Sudan Hospital Laboratory these tests are now carried out by the Sudanese Laboratory Assistant in charge, who has been given special instruction. It is hoped that in due course this precedent may be followed in other important provincial hospitals, but I do not consider that the majority of the Sudanese Assistants can yet be depended on to perform this test with sufficient accuracy, especially in the readings of results. For this reason it is not yet included in the standard curriculum of their training, but will be taught to certain selected candidates.

During the year 11 boys received a laboratory training of four months as described in the 1935 report. Nine passed the examination and were recommended for promotion. A start has been made in training boys from the Southern Sudan and two have already received a preliminary training of four months, instruction being carried out in English. One of these, a Zande, has shown marked intelligence and is well up to the standard of the Northern Sudanese Assistants. It is proposed to continue this training of Southern Sudanese as suitable boys who have a sufficient knowledge of English become available.

Adoption of Sahli-Hellige Haemoglobinometer.

The Tallqvist method is so unsatisfactory in many ways that investigations have been carried out as to the most suitable type of haemoglobinometer for general hospital use. A comparatively inexpensive apparatus is essential and one which can be used with fair accuracy by the Sudanese Assistants. The modern Sahli-Hellige instrument with two prisms and a square cell for dilution of the blood with the N/10 HCL, has been tested and fulfils these desiderata very satisfactorily.

The technique of its use is very simple and is now taught as a standard method to all assistants under training. The apparatus has been issued to six of the large hospitals and it is hoped that it will be a valuable aid to Medical Inspectors.

TEACHING PATHOLOGY TO MEDICAL STUDENTS.

There is nothing fresh to add to the remarks made in the 1935 report. The rarity of post mortems remains a weak feature.

ROUTINE EXAMINATIONS.

PATHOLOGICAL SPECIMENS.

The total for the year was 442.

POST-MORTEMES.

26 were carried out in Khartoum Civil Hospital during the year, 9 were medico-legal.

NEOPLASMS.

140 were received of which 36 were benign and 104 malignant.

A list of the malignant tumours is appended.

ORGAN OR TISSUE.	Carcinoma	Sarcoma	Total.
Breast	14	1	15
Female genitals	5	3	8
Kidney	1	0	1
Bladder	1	0	1
Lip and mouth	5	1	6
Salivary glands	2	0	2
Liver	3	0	3
Anus and rectum	5	0	5
Lymphatic glands	0	3	3
(secondaries)	1	0	1
Eye and orbit	5	4	9
Maxilla and maxillary antrum	2	2	4
Neck	2	4	6
Skin	9	2	11
Leg	0	4	4
Sole of foot	1	3	4
Subcutaneous tissue, fascia, tendons	0	11	11
Bone	0	2	2
Site unknown	3	5	8
	59	45	104

Comments. The conventional classification of sarcomata and carcinomata is retained for convenience ; included in the former are two melanomata while in the latter are four tumours from the eye and orbit which are probably of epithelial origin. Any attempt to analyse the details of age and sex would be merely misleading ; in most cases the age is not given and although males as usual are in the majority, no conclusion as to the comparative frequency of neoplasms in the sexes can be drawn as fewer women than men come to hospital or submit to operation.

SEATS OF ELECTION.

Female Genitals. There were three squamous epitheliomata of the vulva, one from the vagina, and one adeno-carcinoma from the vulva. Three sarcomata were from the uterus.

Bladder. This was a case of epidermoid carcinoma following bilharzial infection ; there were numbers of ova present among the nests of tumour cells.

Anus and Rectum. Four squamous epitheliomata from the anus and one adeno-carcinoma of the lower end of the rectum. It is most unusual to find malignant neoplasms in either the stomach or lower alimentary tract and a previous case of cancer of the rectum has not been recorded for years. A careful search was made for ova of *S. mansoni* both in sections and in pieces of the tissue macerated in caustic potash, but all were negative.

Liver. Three primary adeno-carcinomata.

Mouth. The epithelial tumours comprised four squamous epitheliomata and one adeno-carcinoma. It is probable that the latter was derived from a salivary gland.

Sole of foot. One melanoma, two alveolar sarcomata and one myeloid sarcoma apparently arising from the first metatarsal.

Skin. There were eight squamous epitheliomata ; in most of these the site was not given. One a malignant ulcer of the groin, proved to be a melanoma. The latter is of some interest ; the primary growth was an ulcer which was excised from the sole of the foot and which had the histological structure of an alveolar sarcoma. Some months later, recurrence took place as an ulcer of the groin with metastases in the adjacent inguinal glands. The ulcer had the structure of an alveolar sarcoma while the glands were invaded with tumour cells which presented the features of epithelium. In places they were arranged in an atypical acinous formation and the general histological picture was that of an alveolar carcinoma. The patient died about a month later and post-mortem showed wide-spread metastases throughout the body (heart, testicle, liver, spleen).

All metastases presented a typical picture of a deeply pigmented melanoma of a sarcomatous structure. Ewing (Neoplastic Diseases) points out that "there is no relation between the degree of pigmentation of primary and metastatic tumours" and the present case is an example of an apparently apigmented primary growth but with increasing malignancy in its metastatic nodules, producing large amounts of pigment. Alveolar sarcomata of the sole of the foot and of the hand are by no means uncommon in the Sudan *e.g.*, in the above list 2 out of 3 of the sarcomata from the foot were of this type.

It is unfortunately impossible to follow up the majority of these cases but taking into account the above case and the fact that the foot is commonly the seat of melanoma there seems to be a definite possibility that some of these tumours are really melanomata.

Rabies. 128 brains from all parts of the Sudan were received of which 13 arrived decomposed and useless for examination. An analysis of the remainder showed the following figures:—

42 were positive for Negri bodies—the distribution being 34 dogs, 5 donkeys, 1 cat, 1 sheep, 1 rabbit (inoculated from human case).

Human case. This was a native woman who died in Omdurman hospital 4 months after being bitten on the right hand by a dog and who had not received treatment. On admission she gave a history of 8 days illness and her general appearance was that of exhaustion. There were no spasms, she could speak normally and was able to swallow saliva. Reflexes were absent and the muscles were flaccid. She died on the day of admission. Owing to opposition from the relatives, it was unfortunately impossible to perform a post-mortem, but through a small trephine hole in the skull a piece of cortex was removed. Histological examination was negative for Negri bodies. Of two rabbits inoculated subdurally with an emulsion of the brain one died in 21 days and examination of the hippocampus showed Negri bodies.

Method of staining. Lèpine's stain has now been adopted in place of Leishman's and although a somewhat coarse stain for the finer details of cellular structure it stains Negri bodies with great distinctness. The research, mentioned in 1935 report, on the comparative values of the mid-brain and hippocampus as sites of election for Negri bodies has been completed and is in course of publication. The hippocampus is, incomparably, the better site for examination.

Rabies Vaccine. 38,430 c.cs. were issued during 1936.

A special temporary arrangement has been made with the Director of Medical Services, Nigeria to send weekly to Lagos by Imperial Airways a supply of 4% vaccine and up to December 1936, 7,000 c.cms. have been supplied. Vaccine of 2.5% is used as routine in the Sudan but in view of the very favourable results obtained with 5% vaccine in badly bitten cases in Kasauli it is proposed to follow this practice also in the Sudan.

The details of preparation as previously given (1935) have remained unaltered.

Cerebrospinal Meningitis. Strains from the Nuba Mountains epidemic were isolated by Dr. Kirk and other strains were isolated from local outbreaks in Khartoum, Omdurman and the Blue Nile Province. All strains were put up against Groups I and II sera (Standards Laboratory, Oxford). As on previous occasions, results were confusing. 39 strains were examined—of these 4 gave a partial agglutination with Group I serum (titres 1 in 50 to 1 in 125) and were negative with Group II serum. These strains came from widely different localities. Of the remainder, one was completely negative and 34 were agglutinated by both sera, in most cases to a titre of 1 in 125 but some to the end point of both sera (1 in 250). With some of these strains agglutination appeared slightly more complete at the same titre with Group I than with Group II serum, but the difference was slight and in several cases when the tests were repeated with suspensions made from subcultures no difference could be detected.

Absorption tests were not carried out. The above results are in accord with those obtained with epidemic strains isolated in the Nuba Mountains in 1935 (Report 1935). The interpretation of such results is very difficult; one would expect that the so called epidemic strains comprising Group I would be in the majority in such extensive and severe epidemics as have occurred in Kordofan for the past few years. The above results lend no support to this suggestion and the few strains which could be definitely classified as Group I were scattered about in various widely separated areas. In view of this antigenic overlapping, it seems distinctly unlikely that the Group Sera at present issued from the Standard Laboratory are likely to afford any help in an antigenic classification of strains in the Sudan or act as a guide to specific serotherapy. It is even doubtful if such results are an indication for the use of polyvalent serum, as there is no evidence that the strains from which such are prepared even correspond in their principal antigens to the local strains; at least in the writer's opinion there has been no clear evidence that the polyvalent serum used in a number of cases in 1936, had any specific influence on the infection.

ENTERIC FEVER.

The great majority of the cases were due as usual to *B. typhosum*. A certain amount of work has been carried out during the year on the Vi antigen of *B. typhosum* and the results published (Journal of Hygiene 1936—Vol. 37 p. 368). They clearly showed that all freshly isolated strains, either from blood, faeces or urine contain this antigen. The inagglutinable strain isolated from a child and mentioned in the 1935 report has been fully investigated and proved to be a typical V, with a high virulence for rats and gerbils (mice are not available in Khartoum). The patient, whose serum in the 3rd week agglutinated a V suspension to a titre of 1 in 250, recovered after a stormy illness. No other V strain has so far been isolated.

The results which are given in full in the above paper show that no assistance to prognosis or to serum treatment is afforded by an examination of the serum for Vi antibodies.

Vaccine Preparation. A smooth V strain of *B. typhosum* is used whose minimum lethal dose in rats or gerbils is constant at about 50 or 60 $\times 10^6$ organisms, and which kills the majority of the animals in 20 to 24 hours. The heart blood is plated on to agar plates, colonies are isolated, subcultured into broth and tested against high titre V and O sera. The method is essentially that recommended by Perry, Bensted and Findlay 1934 (Journal of Royal Army Medical Corps Vol. 62-p. 161).

It has been recently shown by Craigie and Brandon that 4 hours broth cultures of freshly isolated strains have a maximum content of Vi antigen. Hence it seems desirable to use broth subcultures of this age to inoculate the bottles of agar from which the suspensions for the vaccine are prepared. The present practice still is to add 0.5% Phenol as a preservative as recent work on the whole shows that this does not interfere to any appreciable extent with the protective value of a V vaccine although inhibiting the production of Vi agglutinins. It has been shown by the writer that a vaccine killed at 55° C. and preserved in the cold without a preservative is still capable of producing Vi agglutinins, but, owing to the risks of contamination, it appears undesirable, at present, to issue such a vaccine for general use in the Sudan.

CHOLERA VACCINE.

Although Cholera does not exist in the Sudan, a considerable quantity of cholera vaccine is issued yearly to Suakin quarantine for use in pilgrims travelling to Mecca. Owing to the considerable recent advances in the knowledge of the

antigenic structure of vibrios, there appears at present to be considerable differences of opinion as to the best type or types of strains of vibrios to be used for vaccine. It would appear to be essential to use strains of sub-group I isolated from cholera epidemics but while some authorities use a number of recently isolated strains, others prefer the use of a single standard strain of proved stability.

In a private communication Colonel Taylor, Kasauli Institute recommends the use of two standard strains of the Inaba and Ogawa types respectively and has very kindly supplied the necessary cultures.

YELLOW FEVER.

Survey work has been continued as follows :—

(1) The examination of liver sections from fatal cases of pyrexia of obscure origin. The tissue is obtained either by viscerotomy or at post-mortem examinations.

During the year 16 livers from all parts of the country have been examined histologically, but in no instances were the changes suggestive of Yellow Fever.

(2) Mouse protection tests.

(A) A series of sera was collected from the natives of the Eliri district of the Nuba Mountains by Dr. Kirk and forwarded to Dr. G. M. Findlay of the Wellcome Bureau of Scientific Research, London for mouse protection tests.

The results were as follows :—

Of 27 sera from Eliri 12 (44 %) were positive and 15 (56 %) were negative.

Of 18 sera from Lafufa 5 (28 %) were positive and 13 (72 %) were negative.

Of 5 sera from Nyaro 3 (60 %) were positive and 2 (40 %) were negative.

Of 38 sera from Kau 30 (79 %) were positive and 8 (21 %) were negative.

Of 31 sera from Heiban 3 (10 %) were positive and 28 (90 %) were negative.

Of 39 sera from Gulfan 8 (21 %) were positive and 31 (79 %) were negative.

The results indicate that there has been a widespread infection with the virus of yellow fever throughout the Nuba Mountains during the last 20 years, the youngest individual in whom a positive was obtained being 12 years of age. Careful investigations, however, have not so far discovered any clinical cases of Yellow Fever. The results at Kau are particularly interesting where almost 80% of the population have positive sera, but where there is a complete absence of any history of jaundice or other suggestive clinical condition. The evidence at present is that the infection is entirely subclinical, but a permanent dispensary has been established at Kan with a view to obtaining as completely as possible a medical history of the population throughout the year.

Another interesting point, which it is hoped to investigate more fully, is the striking difference in the percentage of positive sera in adjacent and apparently similar districts.

(B) During the year the mouse protection test has also been carried out on the sera of a number of cases of obscure febrile jaundice. Of 25 cases examined two, one from Malakal and the other from Medani, have given positive results. As the sera of these cases were not examined at the onset of the illness, these results are of little significance, the available evidence suggesting that they were due to some previous infection.

(C) Results of mouse protection test with animal sera.

Monkeys—14 *Cercopithecus aethiops* and 1 *Cerocpithecus phyrhonotis* have been tested. The latter was negative, and of the former one was positive and 13 negative. Unfortunately it was not possible to determine the original habitat of the monkey whose serum was positive.

Cows—Sera from 13 cows from Khartoum, White Nile and Western Kordofan have been examined. Those from Khartoum and the While Nile were negative, while of those from Kordofan 2 out of 4 were positive both of which came from areas where positive human sera have been found previously.

Investigations are being continued on these lines, and extended to include other species of wild and domestic animals.

(3) Mosquito survey—This is considered in the Medical Entomologist's report.

• Rift Valley Fever—Some of the sera from the Nuba Mountains were tested also for protection against the virus of Rift Valley fever, and 7 were found to be positive, all from the southern area of the Nuba Mountains. This matter requires further investigations as no epizootics resembling Rift Valley fever are known among the domestic animals of the country, yet it is most unlikely that these Nuba have visited Lake Naivasha in Kenya, the only area where at present Rift Valley fever is known to occur.

VACCINE LYMPH.

Further experiments were carried out during the early months of the year with strains of seed lymph recieved from Dr. E. C. Smith, Lagos, and Colonel W. D. Stevenson, Government Lymph Institute, Colindale. From both strains, but particularly with the Nigerian, several calf lymphs of high potency were obtained. The method of testing for potency on rabbits as used in Colindale has been carefully followed and each dilution inoculated on to several animals. On the whole there was a fairly satisfactory agreement of the results from different animals but the local laboratory rabbits vary considerably in their susceptibility to the virus. As a further test, it was decided to use some of the batches made during 1935 for human vaccination and during the months of April and May (1936) several hundreds of homecoming pilgrims were vaccinated at Suakin quarantine. This constituted a severe trial for the lymphs as in addition to many persons having old scars of small pox all pilgrims had been vaccinated only two or three months previous on their outgoing journey with a lanolated lymph.

The results from the first lot of 515 pilgrims were as follows :—

Batch of Vaccine	...	...	...	...	A	B	C
Per cent positive ...	...	...	...	...	51	57	44

Three weeks later a second lot of 328 were vaccinated.

Batch of vaccine	...	...	...	...	...	B	D
Per cent positive ...	...	...	...	...	...	62	48

Taking the above consideration into account, these results must be considered distinctly favourable and agree with the results of the rabbit potency test both methods showing the superior potency of batch B. The results of the experimental vaccine were considered sufficient proof that calf lymph vaccine of reasonable potency could be manufactured in Khartoum, and during the summer months suitable calf stables were built and the necessary lymph grinding apparatus obtained from England. Regular lymph production commenced in November and it is hoped as soon as suitable stocks have accumulated, to supply all the requirements of the Sudan. For the pilgrims season 1936/37 all vaccinations are to be carried out with the locally produced lymph.

Since the inception of this work the most valuable assistance has been given by the Senior Veterinary Research Officer who not only designed special calf stables suitable for the climate of Khartoum but has kindly lent a number of calves from his own experimental animals.

Before calf lymph vaccine was finally decided on for routine use, careful consideration was given to the possibility of using culture vaccine. The matter was discussed with the Senior Pathologist, Nigeria who has been carrying out experimental work with virus cultivated in chicken embryos. Vaccine of high potency was readily obtained but the titre dropped rapidly after a few days at ordinary temperatures. At the International Congress of Microbiology held in London during July 1936, Dr. Rivers of the Rockefeller Institute described the very favourable results he had obtained with virus cultivated in minced chicken embryo and dessicated "in vacuo." This dried vaccine when kept in sealed tubes "in vacuo," remained stable for a considerable time at ordinary temperatures.

It would appear however that it is only fully potent when inoculated intradermally, and with the usual scarification may not give more than 60—70 per cent. positives in susceptible individuals.

Vaccination is normally carried out in the Sudan by the Assistant Medical Officers and for such the intradermal method may present difficulties. In the writer's opinion, however, the chief disadvantage of the method for the Sudan is the absence of scarring which provides such an easy proof of vaccinal immunity with the ordinary scarification method.

For these reasons it was not considered justifiable to substitute for routine use a culture vaccine in place of the older and well proved method of vaccination with a calf lymph.

SUMMARY OF ROUTINE EXAMINATIONS.

Blood—Khan's Test ...	11,490	Faeces ...	1,390
„ Widal Reaction ...	646	Urine ...	711
„ Cultures ...	434	Throat swabs :	
„ Films ...	1,006	Diphtheria positive ...	46
Cerebrospinal Fluids ...	511	„ negative ...	683
Biochemical ...	73	Sputum T.B. positive ...	13
Autogenous Vaccines ...	22	„ „ negative ...	119
Pathological Histology (including examination of brains for rabies) ...	557	Spleen smears (Kala-azar) positive ...	14
		General Bacteriology ...	326

Summary of Faeces Tests.

Flexner isolated ...	6
„ Y „ ...	18
Shiga ...	19
Schmitz „ ...	9
Sonne „ ...	2
Typhoid „ ...	42
Amoebae present ...	16
Ova „ ...	89
Negative ...	1,189

Summary of Urine Tests.

Typhoid isolated ...	45
Ova present ...	6
Negative ...	660

Summary of Widal Tests.

Typhoid ...	90
Paratyphoid A ...	0
Paratyphoid B ...	0
Melitensis ...	48
Negative ...	508

Summary of Blood cultures.

Typhoid ...	59
Paratyphoid A ...	4
Paratyphoid B ...	1
Melitensis ...	0
Streptococcus ...	4
Other organisms ...	8
Negative ...	358

Summary of examinations of Blood Films for parasites.

Malaria.

Benign tertian ...	41
Subtertian ...	133
Quartan ...	2

Relapsing Fever ...	2
Negative ...	828

Total examinations for 1936--18041.

REPORT

ON

MEDICAL ENTOMOLOGY.

BY MR. H. W. BEDFORD.
GOVERNMENT ENTOMOLOGIST.

1. Introduction.

The present report contains a resumé of the work of the Entomologists of this Section detailed for Medical Entomology. Mr. F. G. S. Whitfield, who occupies the dual post of lecturer in charge of Biological teaching at the Kitchener School of Medicine and Gordon Memorial College, and Medical Entomologist has had to devote considerably more of his time to the former duties than was originally conjectured.

As Medical Entomologist he has been responsible for all research and systematic work pertaining to Medical Entomology, with the exception of mosquito researches in the Gezira of which Mr. D. J. Lewis, the Medical Entomologist stationed at Wad Medani, has been in charge.

2. Survey of Insects of Medical Importance.

During the course of the year only 250 insects have been received for determination apart from those collected in aeroplanes, and specimens submitted by the Medical Entomologist in the Gezira. Of this total 169 were various species of mosquitoes, including single specimens of *Aedes aegypti* from Gedaref, El Obeid and Kapoeta.

Two species of sandflies were determined, *Phlebotomus minutus*, Roud., var. *signatipennis*, Newst. from Singa and *Phlebotomus papatassii*, Scop. from Abu Haraz, both of which are additional to our records as regards locality.

Of interest is the receipt in May of a single specimen of *Glossina morsitans* from Delami in the Nuba Mountains, since no "fly" has been recorded from this locality for many years.

Work has been continued on the collections and the systematic registration of records maintained.

3. Collection of insects from aeroplanes.

During the year 741 insects were collected from commercial aircraft arriving at Khartoum from Egypt (137), Uganda (179), Eritrea (375), Nigeria (12), and Geneina in Western Darfur (38).

The majority of these insects have been determined and include Diptera 690, Lepidoptera 23, Orthoptera 10, Coleoptera 12, Hemiptera 6, Aphaniptera 1, and Planipennis 1.

Of the above the only ones of economic importance were 49 mosquitoes (not including any *Aedes aegypti*), 9 specimens of *Simulium*, 2 *Tabanidae*, 1 flea and 600 *Musca* spp.

4. Experimental work in Khartoum.

- (1) *Experiment to ascertain the efficacy of stocking artificial pools with the fish *Gambusia affinis* for controlling mosquitoes.*

An artificial pool was constructed in a garden in Khartoum, with a surface area of approximately 10 square metres and a depth of 2 ft. The pool which contained no vegetation was stocked with the mosquito-eating fish *Gambusia affinis* and examined twice weekly for mosquitoes, when all stages found were collected for ultimate determination. The experiment was started in October and discontinued at the end of December.

Mosquito larvae varying from one up to five days old were found on each day of inspection between October 26th and December 28th. Results show that *Gambusia affinis* cannot be relied on as an effective means of controlling mosquito breeding in artificial water in urban areas.

The experiment was also of interest as indicating the presence of egg-laying mosquitoes throughout the period October 26th—December 28th. The problem naturally arises as to whether such mosquitoes were the result of constant immigrations from breeding areas outside Khartoum or whether the same mosquitoes were able to continue breeding over a prolonged period. Full results will be embodied in a paper which is in preparation.

- (2) *Experiment to control "Chironomid" flies in Khartoum,*

Gardens and houses in the near vicinity of the Blue Nile in Khartoum are subject annually to invasion by myriads of non-biting midges (*Chironomidae*) which breed in the mud in the shallower channels of the river as the latter recedes. The flies on emergence make for gardens near by where they collect amongst the vegetation and swarm round lights in the evening.

Two experiments were started towards the end of the year with a view to abating this nuisance. The first experiment aims at attracting the flies to lights arranged as traps or attractants, the second at the destruction of adults prior to their emergence from the river by oiling the water-surface. Sufficient time has not yet elapsed to form an opinion as to the efficacy of these methods.

5. Mosquito Research in the Gezira.

(1) *Survey of Anopheline mosquitoes* was carried out in the Gezira Irrigated Area, along the banks of the Blue Nile and at the Sennar reservoir. Monthly examinations of breeding places were made in the first two areas, which show the relative importance of difference types of breeding places at all times of the year. 52,000 larvae were collected in 25,000 dips of a net.

Of the different species of Anopheline mosquitoes which occur in the Gezira, *A. gambiae* greatly outnumbers other species in the irrigated area and is the only proved vector of malaria. Dissections of 116 females in September showed an infection rate of 2.6% in the salivary glands. It breeds throughout the year and adults may be found in houses from August to April. The present system of baling out the minor irrigation channels after watering destroys vast numbers and a better knowledge of the bionomics of this species (*e.g.*, localised areas of breeding referred to below) is likely to assist considerably in effecting much improved control.

In the period after the rains, when the chief annual rise in the number of cases of malaria occur, most anopheline larvae are found in grassy pools rather

than irrigation channels, and experiments with Paris green are being continued in order to ascertain the practicability of this form of control under local conditions. The great flood areas of former years are of far less importance than before owing to drainage, but small pools often form in the original low lying areas.

(2) *Breeding Areas.*

(a) GEZIRA SCHEME. The two chief breeding places for Anophelines are pools in the minor irrigation canals watering cotton (with an average of 18.7 larvae to the square metre) and water standing among dura (33.2 larvae per square metre).

From results obtained from the larval survey certain information should prove most useful in planning modifications in present control methods.

The distribution of *A. gambiae* was found to be very uneven and indicated distinct localisation of breeding round certain centres of human habitation. In the remainder of the area examined although ideal conditions such as stagnant pools were seen none were infested with larvae.

For instance, it was found that in an area in the close vicinity (S.W.) of the Research Farm pools in abu sittas (minor water channels) contained 83.3 larvae per square metre and 79% of them contained over 25 larvae per square metre (and often several hundred), while no pools were devoid of larvae. In the open Gezira on the other hand the respective figures were 11.1, 10% and 35%. A man applying a larvicide in the first area would waste no time in visiting water containing no larvae, whereas in the second and much greater area about 35% of his time would be non-effective.

The seasonal distribution of larvae in abu sittas shows two annual peak periods, in March and a few days in April, and again in October and November. In March and April 44 larvae were obtained per square metre, and in October and November the figure was 28, while for the remaining four months of irrigation only 3 larvae were found per square metre. There is also a striking difference between the distribution of larvae in the abu sittas during the two periods. In the very hot dry weather of March and April nearly all the larvae (2,449 out of 2,568) occurred in the deeply scoured "dowrans" whereas in the less hot weather of October and November 10,011 out of 10,200 of the larvae were found in shallow pools which dried more slowly, thus allowing more eggs to be laid in them.

The seasonal larval distribution in canals is different from that in minor irrigation channels. Of the 2,591 larvae collected in 4,804 dips during the year, 1,955 were collected in 1,160 dips from August to October.

Flooded dura plots are responsible for a great increase in *A. gambiae* in October. In one hut alone 1,102 adults were collected on October 18th. Later shortly after the cessation of watering (November 2nd) the same hut contained 168 and on November 17th only 16.

(b) BLUE NILE RIVER BANKS. The chief anopheline breeding places during most of the year are mud, sand and rock pools in which *A. gambiae* predominates. During periods of flooding the forests and open country alongside the river produce a vast number of mosquitoes, different species predominating at different periods. There is a relation between the method of cultivation of the trees and the anopheline species produced, which is being investigated.

(c) SENNAR DAM RESERVOIR. All the seven species of *Anopheles* already mentioned occur at Sennar but *A. pharoensis* predominates in the town and over 80% of the larvae in the reservoir are probably of this species.

The chief breeding places of anophelines is a large area of the grass *Echinochloa stégna* growing in the reservoir. Since the dam was built, this plant has spread over an area of more than 700 feddans within 5 kilos of the dam and is still spreading. In the past year the main area has extended 800 metres to the north-west, thus adding a further 20 feddans in this direction alone. *Echinochloa* plants grow to a length of 20 feet, spreading along the water surface and anopheline and culicine larvae occur among them. During 1936 a survey of the breeding area was made, the result of past control measures noted, and special attention was paid to the relation between anopheline larvae and the different species of water plants. Some species are apparently unfavourable to anopheline breeding and experiments are being carried out in connection with the possibility of encouraging these species at the expense of *Echinochloa*. Direct action against the weed in past years has been effective in destroying considerable areas and checking its nearer approach to Sennar, but such measures have to be repeated annually.

(3) *Experiments on control methods.*

(a) PARIS GREEN was used on cotton abu ishrins and abu sittas, gardens, floods, forests, a swimming bath and the Sennar reservoir. Sifted Blue Nile river-silt was found to be a very suitable diluent under all conditions and is readily accessible.

Paris green has been successfully employed as a larvicide on the Research Farm for six months at a cost of P.T. 4 per day as compared with P.T. 50 previously spent on oil. Berseem plots have been treated regularly without any ill effects to stock.

(b) TRAPPING. Experiments have been confined to methods of trapping adult mosquitoes as a control measure and an indication of numbers present. The most effective trap tested was a modification of the window type used by Le Prince and Orenstein in Panama. Three of these trapped 4,000 *A. gambiae* during three months in the rains.

(4) *Occurrence of mosquitoes other than Anopheles.*

Aedes (Stegomyia) aegypti has only been seen on four occasions.

During the rains *Culex poecilius*, Theo., *Lutzia tigripes*, Grp., *Mucidus scatophagoides*, Theo., and others were common at Wad Medani. At Sennar *Mansonia africana*, Theo., bites during the day and *M. aurites*, Theo. occasionally appears.

PROGRESS OF WORK.

Curative Medicine. The following figures show the number of inpatients, outpatient attendances and operations performed during the last ten years :—

YEAR.	Inpatients Admitted.	Outpatient Attendances.	Operations Performed.
1927	33,407	1,457,706	3,445
1928	39,965	2,004,283	3,913
1929	46,033	2,675,085	4,337
1930	49,911	3,840,923	6,110
1931	59,763	4,044,439	6,798
1932	59,642	4,264,412	7,287
1933	70,315	5,092,999	8,600
1934	85,990	6,039,197	10,082
1935	89,093	6,112,303	11,124
1936	96,081	6,500,441	11,229

Hospitals. The new Omdurman Hospital for men will be completed in May 1937, and when this is completed, and a few additions made to existing hospitals, it is considered that the hospital facilities will be as adequate as can be supervised or maintained efficiently.

The number of beds represent 1 per 1000 of the population. Future development will aim at improving existing facilities by providing X Ray sets, better laboratory, outpatient and operating accommodation and raising the standard of efficiency of subordinate staff.

Dispensaries. There are 337 dispensaries and it is not intended that this number will be increased appreciably in the near future. The whole country is covered by as close a net work as is justified and sufficient to bring medical aid within reasonable reach of the whole population.

In a sparsely populated country like the Sudan dispensaries must be sited far enough apart to allow each dispensary a large enough population to draw its sick from to justify the cost of staff and maintenance.

The establishment of an adequate hospital and dispensary service is the first task in the medical administration of a country, as it enables the confidence of the people to be gained, and sweetens the pill of preventive medicine which follows it, but it is essential that the progress of the second and really more important function of a medical service, that of prevention of disease, is not held back by lack of funds owing to the cost of the more popular and spectacular curative branch.

It is considered that any additional funds available in the immediate future would be spent to best advantage on preventive medicine.

Preventive Medicine. The organisation of this branch of medicine has been extended, and its ramifications now extend into all parts of the Sudan. A British Sanitary Inspector has been posted at Juba to establish a training centre for southern staff, and to supervise the sanitary work in Equatorial Province.

Considerable progress has been made in training subordinate sanitary staff who will be posted to towns and districts throughout the country.

Village water supplies and conservancy have been improved in many districts particularly the White Nile and Blue Nile Provinces and a start has been made in an attempt to improve diets. The difficult problem of housing is also being tackled. There is almost unlimited scope for effort along these lines, and although public health improvements are often costly it can hardly be questioned that money spent on improving the standard of living, housing, water supplies, and sanitation of the people is well spent.

It is anticipated that the reorganisation of the public health service will be completed by the end of 1937.

Medical Research. The following schemes of medical research were carried out during the year :—

- (1) Investigations into the cause of kala-azar
- (2) Yellow fever.
- (3) Malaria research with reference to the mosquito vectors in the Gezira.

TRAINING.

Courses of training are organised for the following categories of medical and sanitary staff:—

Medical Officers	Sanitary Officers
Dispensers	Sanitary Overseers
Asst. Medical Officers	Female Nurses
Asst. Radiographers	Midwives
Laboratory Attendants	
Hospital Orderlies	

It is anticipated that by the end of 1937 90% of the male classified officials in the Sudan Medical Service will be Sudanese.

Medical Officers. (*See* Kitchener School of Medicine Report page 88.)

Sanitary Officers. (*See* page 36.)

Dispensers.

A course of training lasting two years commenced during the year. Four Assistant Medical Officers who had had long practical experience in dispensary work were selected to take the course.

Assistant Medical Officers.

Hospital orderlies of good education and considerable experience are selected for training as Assistant Medical Officers. After a twelve months course which includes lectures in public health, written clinical and practical examinations are held. Those who reach an adequate standard are appointed Assistant Medical Officers and take charge of village dispensaries.

Nine passed at the end of the year.

Laboratory Attendants. (*See* page 72.)

Assistant Radiographers.

One was under training during the year.

Hospital Orderlies.

A six months course for senior orderlies in nursing and hospital routine was held at Khartoum Civil Hospital under the direction of the Matron.

Nurses Training School.

The school is attached to the Omdurman Civil Hospital. Seventeen pupils were accepted for training during the year, and seven were discharged for various reasons. Six were examined at completion of training and were passed. The length of the course is two years.

Midwifery Training School. (*See* page 80.)

KITCHENER SCHOOL OF MEDICINE.

ANNUAL REPORT.

BY MR. D. R. MACDONALD.

Number of Students.

Ten new students were admitted in 1936. The classes were composed as follows :—

Medical Students :—

1st Year...	10
3rd Year...	7
4th Year...	7

Sanitary Students :—

2nd Year...	2
3rd Year...	4

TOTAL	30
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Death of Dr. Fadil Dafallah.

It is with deep regret that I have to record the death in December 1936 of Dr. Fadil Dafallah. Dr. Fadil Dafallah qualified in January 1932, taking the first place in the Final Examinations and being awarded the Prize in Medicine. During his career at the Medical School his work was of a consistently high quality and his personal charm endeared him both to his teachers and to his fellow students. His loss has been most keenly felt.

Progress of Classes.

Professional examinations were held in 1st, 3rd and Final Year subjects.

1st Year Examination Results.

Ten candidates were examined in Chemistry, Physics and Zoology. Of these eight students reached the required standard and will continue their medical studies. Of the remaining two, one has been enrolled in the special scientific class to be held in the Medical School in 1937.

3rd Year Examination Results.

Seven candidates were examined in Anatomy and Pharmacology. All candidates reached the required standard and will continue their studies in the 4th year subjects.

Final Examinations.

The School was fortunate in obtaining the services of J. S. Fairbairn, Esq., M.A., F.R.C.S., F.R.C.P., F.C.O.G., late consulting Obstetrician and Gynaecologist to St. Thomas's Hospital, and H. Letheby Tidy, Esq., M.A., M.D., F.R.C.P., Physician to St. Thomas's Hospital, Representative of the Royal College of Physicians on the General Medical Council, as assessors in Midwifery and Medicine respectively.

Seven students were examined in Medicine, Surgery, Midwifery, Gynaecology Pathology, Public Health, Forensic Medicine, Psychiatry and Pharmacology.

Six candidates were successful and will be posted to the larger hospitals in the Sudan as House-Surgeons and House-Physicians for one year on probation.

The successful candidates were (in order of merit) :—

Fuad Shihata	}	Equal.
El Mubarak El Fadil Shaddad		
Zein el Abdin Ibrahim.		
Abdel Salam Salih el Moghraby.		
Osman Yusif Abu Akar.		
Ahmed El Gasim Ali.		

Prizes were awarded as follows :—

Waterfield Prize in Surgery	}	Fuad Shihata
Balfour Prize in Public Health.		
Prize in Medicine — El Mubarak El Fadil Shaddad.		

Presentation to the Medical School.

The School Council gartefully accepted a framed portrait in oils of Earl Kitchener of Khartoum K.G. by C. M. Horsfall, kindly presented by Sir George Arthur. The portrait was unveiled in the School Library by the Acting Governor-General on June 5th, the anniversary of Kitchener's death.

New Works.

A car shelter to accommodate four cars was erected in the grounds of the Medical School.

School Library.

A revised Library catalogue was prepared for issue to medical practitioners throughout the Sudan.

Games.

The students continue to take a keen interest in association football and tennis. The new tennis court opened in the School grounds last year has greatly improved the standard of play and it is hoped that one or two promising players will be strong enough to take creditable part in the Khartoum tournaments next year.

HEALTH

OF THE

SUDAN DEFENCE FORCE

BY MR. N. MACLEOD.

GENERAL.

The health of the Sudan Defence Force remained satisfactory throughout the year. Cerebrospinal meningitis gave rise to anxiety at Khartoum, Shendi, Gedaref and Geneina but the precautions taken inhibited any extensive outbreak and a total of eight cases only occurred.

The following table compares the sickness rate for the last ten years:—

YEAR		Average Annual Strength	Admissions	Average Constantly Sick	Ratio per 1000 of strength		Days lost through sickness	
					Admissions	Average Constantly sick	for whole force	for those sick
1927	...	8,809	5,396	149.36	612.55	16.95	6.18	10.1
1928	...	7,086	4,840	157.86	683.03	22.27	8.14	11.9
1929	...	7,024	4,916	145.2	699.88	20.67	7.54	10.78
1930	...	6,527	4,817	158.91	738.01	24.34	8.88	12.04
1931	...	5,333	4,194	96.65	786.42	18.11	6.61	8.41
1932	...	4,828	4,054	111.7	839.68	23.13	8.44	10.05
1933	...	4,919	4,097	120.5	832.89	24.49	8.94	10.73
1934	...	4,715	4,219	132.27	894.80	28.05	10.24	11.44
1935	...	4,726	3,419	121.34	723.44	25.67	9.41	13.0
1936	...	4,440	3,669	117.24	826.35	26.40	9.64	11.66

Wounds and other injuries share with malaria, the responsibility for the greatest number of admissions to hospital. The former is accounted for by the extensive movement of troops which took place during the course of the year and is also a concomitant of increasing mechanization. Having regard to the fact that troops were in stations which normally they would not have occupied during the rains and immediately after the rains it would not have been surprising if the total incidence of malaria had been higher than it actually was. Most of the malaria occurred among units operating in unhealthy areas along the eastern boundary.

The following table shows the admissions for malaria during the past ten years :—

YEAR.							Cases.	Ratio per 1,000 of strength.
1927	...	...	...	...	...	...	948	107.7
1928	...	...	...	...	...	...	698	98.5
1929	...	...	...	...	...	...	1,165	165.86
1930	...	...	...	...	...	...	706	108.16
1931	...	...	...	...	...	...	741	138.94
1932	...	...	...	...	...	...	810	167.7
1933	...	...	...	...	...	...	1,140	231.77
1934	...	...	...	...	...	...	1,185	272.5
1935	...	...	...	...	...	...	894	187.5
1936	...	...	...	...	...	...	977	220.04

UNDULANT FEVER.

8 cases occurred, 6 of whom contracted the disease in Abu Sanab near Tokar. The troops when at Abu Sanab lived largely on milk supplied by the people of El Khasa. It was ascertained that the milk was that of goats and cattle and that it was freely mixed for transport and sale.

KALA-AZAR.

There was a recrudescence of kala-azar in Gedaref, 6 cases having been infected there during the course of the year. Kapoeta, however, another area in which kala-azar is endemic, produced one case only.

The total admissions for this disease were 10 compared with 4 in 1935 and 11 in 1934.

VENEREAL DISEASES.

Venereal diseases show an appreciable decrease in the number of admissions, 350 having received treatment, in comparison with 559 in 1935 and 593 in 1934.

The venereal diseases situation among the Equatorial Troops is particularly satisfactory, 13 cases syphilis, 1 soft sore and 37 cases gonorrhea only having occurred. Of the gonorrhea total 31 cases were in Wau and 5 in Aweil.

YEAR.	ARABS.		EQUATORIAL.	
	Admissions.	Ratio per 1000 of strength.	Admissions.	Ratio per 1000 of strength.
1927	742	115.76	39	28.55
1928	611	89.48	86	69.8
1929	646	111.09	80	58.73
1930	685	106.91	64	46.98
1931	594	135.4	49	51.81
1932	570	143.0	57	67.69
1933	595	145.44	52	62.8
1934	561	144.3	32	38.6
1935	501	128.7	58	69.6
1936	457	124.6	51	65.9

The following table shows the admissions by diseases in the various stations :—

ADMISSIONS TO HOSPITALS FOR N.C.Os. AND MEN DURING 1936.

	T.B. Disease of Lung	Syphilis	Gonorrhoea	Soft Sore	Trachoma	All Other Eye Diseases	Ear	Skin	Wounds and Other Injuries	Non-Malignant Tumours	Poisoning	Bilharziasis	Dysentery Amoebic	Dysentery Bacillary	Madura Disease	Malaria	Kala Azar	Yaws	Ancylostomiasis	Dracontiasis	C. S. M.	Chicken Pox	Enteric Fever	Influenza	Undulant Fever	Measles	Mumps	Pneumonia	Circulatory System	Respiratory System	Alimentary System	Genito Urinary System	Nervous System	Fever of Unknown Origin	All Other Diseases	Total		
Khartoum	2	19	41	6	12	17	4	1	76	—	4	17	9	—	—	49	—	—	—	—	2	2	—	—	10	1	—	1	5	1	11	28	4	1	6	105	432	
Shendi	1	13	25	—	—	21	—	5	63	—	—	11	7	—	—	67	—	—	—	—	2	2	7	—	—	—	—	—	—	—	—	—	—	37	40	407		
El Obeid	1	9	29	11	—	3	2	—	54	4	—	3	13	—	—	133	—	—	—	—	—	—	—	2	1	—	1	1	—	—	—	—	5	3	302			
Dilling	—	2	2	—	—	—	—	—	11	—	—	—	—	—	—	13	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14	5		
Bara	—	8	4	3	—	5	—	1	27	—	—	—	—	1	—	63	—	—	—	—	—	—	—	—	—	6	—	—	—	—	—	—	—	1	—	5		
Kadugli	—	5	15	—	—	2	—	—	27	—	—	—	—	—	—	23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	80		
Kassala	—	11	17	1	—	3	—	1	26	1	—	—	5	—	—	74	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	179		
Gedaref	—	20	57	—	14	3	4	8	74	—	—	—	11	—	—	242	—	6	—	—	3	3	3	—	9	1	5	—	—	—	—	—	—	—	—	26	596	
Gallabat	—	—	—	—	—	—	—	—	5	—	—	—	2	—	—	37	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	55		
Um Braiga	—	4	8	—	—	—	1	1	35	—	—	—	7	—	—	25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	105	
Fasher	—	65	21	16	1	24	—	9	85	—	—	—	14	—	—	109	—	1	—	—	—	—	—	—	43	—	—	2	—	—	—	—	—	—	—	4	488	
Geneina	—	9	8	4	1	4	—	—	25	—	—	—	5	—	—	81	—	—	—	—	1	—	—	—	2	—	—	—	—	—	—	—	—	—	—	36	150	
Nyala	—	10	14	—	—	7	3	—	71	—	—	1	—	—	—	20	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3	162	
Torit	—	—	1	1	—	5	3	—	62	—	—	—	12	—	—	17	—	1	—	—	—	—	—	7	—	—	—	—	—	—	—	—	—	—	—	—	21	179
Kapoeta	—	—	—	—	—	—	—	—	18	—	—	—	6	—	—	7	—	2	—	—	—	—	—	2	27	—	—	—	—	—	—	—	—	—	—	—	12	95
Taali	—	4	—	—	2	—	—	—	49	—	—	—	2	—	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12	108
Wau	—	7	31	—	—	—	—	—	—	—	—	—	—	—	—	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	57	112
Aweil	—	2	5	—	—	—	—	—	—	—	—	7	—	—	—	3	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18	30
	4	188	278	42	30	94	18	27	708	5	5	39	94	7	1	1977	10	2	5	100	8	10	10	2	2106	9	5	7	34	24	175	170	41	10	77	353	3,669	

THE FOLLOWING TABLE SHOWS THE SICK RATE, ADMISSIONS, ETC., BY STATIONS.

STATION.	Average Annual Strength.	Admissions.	Total No. of days of Sickness.	Average Constantly Sick.	Average No. Days lost through sickness	
					Whole Force.	Those sick.
Khartoum	745	432	6637	18.18	8.9	15.4
Shendi	516	407	4764	13.0	9.2	11.7
Obeid	489	302	3285	9.0	6.7	10.8
Dilling	97	51	620	1.7	6.4	12.1
Bara	182	138	2226	6.1	12.2	16.1
Kadugli	97	80	1235	3.4	12.7	15.4
Kassala	194	179	1875	5.1	9.6	10.4
Gadaref	586	596	6405	17.5	12.8	9.9
Gallabat		55	424	1.1		
Um Braiga		105	704	1.0		
Fasher	364	488	2864	7.7	7.8	5.9
Geneina	198	150	1270	3.5	6.4	8.5
Nyala	198	162	2668	7.3	13.4	16.4
Torit	288	179	2047	5.6	7.1	11.4
Kapoeta	143	95	1036	2.8	10.9	7.2
Taali	143	108	1436	3.9	10.4	13.3
Wau	200	112	3297	9.0	16.4	
Aweil		30				
TOTALS	4440	3669	42793	117.24	9.64	11.66

MEDICAL WORK CARRIED OUT BY MISSIONS.

MISSION HOSPITALS.

1. Omdurman (Church Missionary Society).

STAFF :— 3 British doctors.

5 British nurses.

1 British dispenser.

Beds	...	...	...	60	Outpatient attendances	...	60,194
Inpatients...	...	...	...	1,164	Operations performed	...	231
Abu Ruf dispensary outpatient attendances	...	...	...	...	...	...	23,801

2. Lui, Equatorial Province (Church Missionary Society).

STAFF :— 1 British doctor.

						Inpatients	Outpatient attendances.
Lui hospital	...	...	...	...	...	405	2,912
Dispensaries	...	...	...	...	...	—	26,393

3. Zeraf Island, Upper Nile Province (Church Missionary Society).

STAFF :—1 British doctor.

Outpatient attendances	...	...	...	...	...	8,963
Operations performed	...	...	...	...	...	111

4. Melut, Upper Nile Province (Sudan United Mission).

STAFF :— 1 British doctor.

Inpatients	...	...	...	...	...	367
Outpatient attendances	...	...	...	...	...	5,442

5. Nasir, Upper Nile Province (American Mission).

STAFF :— 1 American doctor.
2 American nurses.

Outpatient attendances	...	...	...	...	29,077
Operations performed	...	...	...	...	40

6. Sallara, Nuba Mountains (Church Missionary Society).

STAFF :— 1 British doctor.
1 British nurse.

Inpatients	...	...	...	...	...	54
Outpatient attendances	...	...	...	...	...	6,866

MISSION DISPENSARIES.

1. Khartoum North (American Mission).

2. Kordofan Province (Sudan United Mission).

at	Abri	Heiban
	Kauda	Abu Leila
	and Tabanya.	

3. Upper Nile Province (Italian Mission).

Lul
Tonga
Detwok

4. Upper Nile Province (American Mission).

at Doleib Hill.

5. Upper Nile Province (Sudan United Mission).

at Rom

STAFF & ORGANISATION.

(A) BRITISH STAFF.

Administration.

Director—who is responsible for the medical, public health, and medical research work carried out in the Sudan, and for the health of the Sudan Defence Force.

Assistant Director (Public Health) who deals with questions concerning preventive medicine.

Assistant Director (Hospitals) who deals with questions concerning curative medicine.

Assistant Director (Laboratories) who deals with laboratory and research work.

Superintendent

Superintendent of Accounts.

Chief Clerk

Chief Storekeeper

Assistant Storekeeper

Special Appointments.

Medical Specialist

Surgical Specialist

Ophthalmic Surgeon

Obstetrical and Gynaecological Specialist

Medical Officer of Health, Khartoum. Medical Registrar seconded to the
Kitchener School of Medicine.

Medical Staff.

33 Senior Medical Inspectors and Medical Inspectors. Matron, 4 Charge Sisters and 10 Nursing Sisters. Radiographer.

Public Health Staff.

13 Sanitary Inspectors.

Inspectress of Midwives, and Matron Midwifery Training School.

Laboratories Staff.

2 Bacteriologists.

4 Laboratory Assistants.

(B) SYRIAN STAFF.

6 Medical Officers, who are being replacd by Sudanese.

2 Dispensers.

(C) SUDANESE STAFF.

Medical Staff.

52 Medical Officers who have been trained at the Kitchener School of Medicine.

239 Assistant Medical Officers. These are selected after several years' training as hospital orderlies, and given a course lasting a year. If they pass the requisite examination, they are placed in charge of dispensaries.

Hospital Orderlies

Female Nurses.

Sheikhs' Dressers and Chiefs' Dressers. These men, who are selected by the Sheikh or Chief concerned from his tribe, carry out simple treatment and report epidemics among the nomad Arabs of the north and the pagan negro tribes of the south.

Public Health Staff.

Sanitary Officers (*See* page 36) and **Sanitary Overseers** (*See* page 36).

Subordinate Sanitary Staff. (House-to-house inspectors, mosquito-men, etc.)

Midwives. These are trained at the Midwifery School, and practise under the supervision of the public health authorities.

Laboratories Staff.

Laboratory Assistants of whom 10 are working at the Stack Medical Research Laboratories, and the remainder at hospitals.

APPOINTMENT.	Establishment.
Medical Staff.	
Director	1
Assistant Director (Public Health)...	1
Assistant Director (Hospitals) ...	1
Senior Physician	1
Senior Surgeon	1
Obstetric Surgeon and Gynaecologist	1
Ophthalmic Surgeon	1
Senior Medical Inspectors	15
Medical Inspectors	18
Syrian Medical Officers	6
Sudanese Medical Officers	52
Assistant Medical Officers	239
Dispensers	2
Radiographer	1
Assistant Radiographers	2
Stack Medical Research Laboratories.	
Assistant Director, Laboratory Services	1
Government Bacteriologists	2
Laboratory Assistants (British)	4
Laboratory Assistants (Sudanese)	10
Nursing Staff.	
Inspectress of Midwives	1
Matron, Midwifery Training School	1
Matron	1
Charge Sisters	4
Nursing Sisters	10
Sanitary Staff.	
Chief Sanitary Inspector	1
Senior Sanitary Inspectors	7
Sanitary Inspectors	5
Sanitary Officers	7
Sanitary Overseers	15
Clerical Staff.	
Superintendent	1
Staff Clerk	1
Clerks	17
Superintendent of Accounts...	1
Chief Accountant	1
Book-keepers	56
Medical Stores Staff.	
Chief Storekeeper	1
Storekeeper (British)	1
Storekeepers (Sudanese)	6
Storemen	9
Tailor	1
Carpenter	1

BRITISH MEDICAL STAFF
SUDAN MEDICAL SERVICE.

ON 31.12.1936.

Director,	...	...	...	Mr. E. D. Pridie, D.S.O., O.B.E., M.B., B.S., 3N.
Asst. Director (Public Health)				Mr. H. A. Crouch, O.B.E., M.C., M.R.C.S. L.R.C.P., D.P.H.
Asst. Director (Hospitals)	...			Mr. N. MacLeod, M.B., Ch.B., 4N.
Registrar, School of Medicine	...			Mr. D. R. Macdonald, M.B., Ch.B.

SPECIALIST APPOINTMENTS.

Senior Physician	...	...	Dr. R. M. Humphreys, D.M., B.Ch., 4N.
Senior Surgeon	...	...	Mr. F. S. Mayne, M.B., F.R.C.S.E.
Obstetric Surgeon and Gynaecologist			Mr. J. S. Hovell, M.B., F.R.C.S.E., M.C.O.G.
Ophthalmic Surgeon	...	...	Mr. A. R. McKelvie, M.B., Ch.B.

MEDICAL SECTION.

Senior Medical Inspector	...		Lt.-Col. G. K. Maurice, D.S.O., M.C., M.R.C.S., L.R.C.P.
„ „ „	...		Dr. A. Cruickshank, M.D. B.Ch., 4N.
„ „ „	...		Mr. A. E. Lorenzen, M.R.C.S., L.R.C.P., 4N.
„ „ „	...		Mr. C. E. G. Beveridge, M.R.C.S., L.R.C.P., 4N.
„ „ „	...		Mr. F. E. Anderson, M.B., B.Ch.
„ „ „	...		Mr. F. H. Goss, M.C., M.B., B.Ch.
„ „ „	...		Dr. L. H. Henderson, M.D., Ch.B., D.T.M. & H.
„ „ „	...		Mr. E. P. Pratt, M.B., B.S.
„ „ „	...		Mr. G. D. Rankin, M.B., B.Ch.

Senior Medical Inspector	...	Mr. H. M. Elliott, B.Ch.
„ „ „	...	Dr. J. Bryant, M.D., Ch.B., F.R.C.P.E., D.T.M. & H.
„ „ „	...	Mr. C. B. Drew, M.R.C.S., L.R.C.P.
„ „ „	...	Mr. J. S. Aldridge, M.R.C.S., L.R.C.P.
„ „ „	...	Mr. E. W. T. Morris, F.R.C.S.
„ „ „	...	Mr. H. M. Woodman, M.B., B.Ch.
„ „ „	...	Mr. A. P. Farmer, M.B., B.S., D.T.M. & H.
„ „ „	...	Dr. N. L. Corkill, M.M., M.D., Ch.B.
Medical Inspector	...	Mr. G. J. Clarke, M.R.C.S., L.R.C.P., D.T.M. & H.
„ „ „	...	Mr. L. Brown, M.R.C.S., L.R.C.P.
„ „ „	...	Dr. R. McN. Buchanan, M.D., Ch.B., D.T.M. & H.
„ „ „	...	Mr. H. Richards, M.B., B.S., D.T.M. & H.
„ „ „	...	Mr. E. K. Malone, M.B., B.Ch., B.A.O.
„ „ „	...	Mr. J. L. D. Roy, M.B., Ch.B.
„ „ „	...	Mr. F. Bartholomew, F.R.C.S.E.
„ „ „	...	Mr. R. W. Stephenson, M.R.C.S., L.R.C.P.
„ „ „	...	Mr. F. L. Wheaton, M.B., B.S.
„ „ „	...	Mr. J. F. E. Bloss, M.R.C.S., L.R.C.P., D.T.M. & H.
„ „ „	...	Mr. W. H. Greany, M.B., B.Ch.
„ „ „	...	Mr. A. Royland Hunt, L.R.C.P., L.R.C.S. (Ed.)
„ „ „	...	Mr. G. C. Cochrane, M.R.C.S., L.R.C.P.
„ „ „	...	Mr. R. B. U. Somers, M.B., Ch.B., D.T.M. & H.
„ „ „	...	Mr. W. F. Townsend Coles, M.B., B.S.
„ „ „	...	Mr. R. P. Campbell, M.B., Ch.B.

STACK MEDICAL RESEARCH LABORATORIES.

Asst. Director Laboratory Services	...	Dr. E. S. Horgan, B.A., M.D., B.Ch., B.A.O.
Bacteriologist	...	Mr. R. Kirk, M.B., Ch.B., B.Sc., F.R.F. P.S.G., D.P.H.

TABLE I.
SHOWS ADMISSIONS AND DEATHS BY DISEASES.

DISEASE.	TOTAL.							
	Europeans.				Non-Europeans.			
	Male.		Female.		Male.		Female.	
	A.	D.	A.	D.	A.	D.	A.	D.
Table "A"								
Tubercular								
1. Disease of lung	5	1	1	—	418	96	95	20
2. All other tubercular diseases ...	1	—	—	—	279	19	69	5
Venereal								
3. Syphilis	—	—	—	—	5,638	22	5,519	17
4. Gonorrhoea	1	—	—	—	1,892	4	393	—
5. Soft sore	2	—	—	—	467	—	28	—
Eye.								
6. Trachoma... ..	—	—	—	—	604	—	348	—
7. All other eye diseases	6	—	3	—	1,558	—	1,049	—
8. Ear	3	—	—	—	222	—	123	—
9. Skin	6	—	—	—	1,111	4	877	4
10. Wounds and other injuries ...	24	—	6	—	15,910	152	4,757	44
Tumours.								
11. Malignant	—	—	2	—	118	30	51	12
12. Non-malignant	—	—	—	—	332	2	152	6
Of Women.								
13. Gynaecological	—	—	4	—	—	—	642	12
14. Confinements	—	—	21	—	—	—	425	22
15. Poisoning	1	—	—	—	75	5	75	5
Total Table "A"	49	1	37	—	28,624	334	14,603	147
Table "B" (Tropical).								
1. Ancylostomiasis	—	—	—	—	414	3	158	2
2. Bilharziasis	—	—	—	—	1,001	7	145	1
3. Blackwater fever	5	2	2	—	26	10	5	2
4. Dysentery, amoebic	9	—	5	—	1,770	39	609	16
5. Dysentery, bacillary	3	—	—	—	136	5	30	1
6. Filariasis	—	—	—	—	213	1	25	1
7. Madura disease	—	—	—	—	628	6	112	2
8. Malaria	82	—	23	—	8,633	57	1,572	17
9. Leishmaniasis (Kala-azar) ...	—	—	—	—	182	24	32	4
10. Trypanosomiasis... ..	—	—	—	—	111	—	39	—
11. Yaws	—	—	—	—	539	1	405	1
12. Sunstroke... ..	1	—	—	—	73	6	—	—
13. Heatstroke	2	—	—	—	155	1	20	—
14. Guinea worm	—	—	—	—	563	—	84	—
15. Tropical ulcer	1	—	—	—	1,626	2	1,339	—
Total Table "B"	103	2	30	—	16,070	162	4,575	47

TABLE I. (Continued).

Disease.					TOTAL.							
					Europeans.				Non-Europeans.			
					Male.		Female.		Male.		Female.	
					A.	D.	A.	D.	A.	D.	A.	D.
Table " C " (Infective).												
1.	Anthrax	...	...	...	—	—	—	—	—	—	—	—
2.	Beri-beri	...	...	...	—	—	—	—	6	2	1	—
3.	Cerebrospinal-meningitis	...	...	...	1	1	—	—	679	342	237	110
4.	Chicken Pox	...	...	...	—	—	—	—	483	7	34	1
5.	Cholera	...	...	...	—	—	—	—	—	—	—	—
6.	Dengue	...	...	...	—	—	—	—	—	—	—	—
7.	Diphtheria...	...	...	...	—	—	2	—	35	6	26	6
8.	Enteric (including paratyphoid )	...	...	...	5	—	1	1	80	13	47	3
9.	Erysipelas	...	...	...	1	—	—	—	11	—	5	—
10.	Gastro enteritis of children	...	...	...	—	—	1	1	132	1	13	—
11.	Influenza	...	...	...	—	—	—	—	713	3	166	6
12.	Leprosy	...	...	...	—	—	—	—	439	35	31	4
13.	Malta fever	...	...	...	—	—	—	—	41	3	17	1
14.	Measles	...	...	...	—	—	—	—	107	—	5	—
15.	Mumps	...	...	...	—	—	—	—	182	—	29	—
16.	Pellagra	...	...	...	—	—	—	—	2	—	1	—
17.	Puerperal fever	...	...	...	—	—	—	—	—	—	5	5
18.	Phlebotomus Fever	...	...	...	—	—	—	—	—	—	—	—
19.	Plague	...	...	...	—	—	—	—	—	—	—	—
20.	Pneumonia (epidemic)	...	...	...	4	2	—	—	1,019	209	243	34
21.	Rabies *	...	...	...	2	—	—	—	36	7	26	1
22.	Relapsing fever	...	...	...	—	—	—	—	—	—	—	—
23.	Rheumatic fever	...	...	...	3	—	—	—	205	4	80	1
24.	Small pox	...	...	...	—	—	—	—	29	1	20	—
25.	Tetanus	...	...	...	—	—	—	—	4	2	2	—
26.	Typhus	...	...	...	—	—	—	—	—	—	—	—
27.	Whooping cough	...	...	...	—	—	—	—	32	1	6	—
Total Table " C "					16	3	4	2	4,235	636	994	172
Table " D. "												
1.	Circulatory system	...	...	...	6	—	3	—	463	86	223	43
2.	Respiratory system	...	...	...	20	2	5	1	2,500	143	331	7
3.	Alimentary system	...	...	...	65	2	24	—	3,181	170	1,261	56
4.	Genito-urinary system	...	...	...	18	—	1	—	1,846	82	364	19
5.	Nervous system	...	...	...	6	1	3	—	452	44	108	8
6.	Scurvy	...	...	...	—	—	—	—	82	2	7	—
7.	Diabetes	...	...	...	—	—	—	—	80	1	21	2
8.	Fever of uncertain origin	...	...	...	25	—	1	—	752	20	130	5
9.	All other diseases	...	...	...	40	—	5	—	8,360	64	6,358	44
Total Table " D "					180	5	42	1	17,716	612	8,803	184
" " " A "					49	1	37	—	28,624	334	14,603	147
" " " B "					103	2	30	—	16,070	162	4,575	47
" " " C "					16	3	4	2	4,235	636	994	172
Grand Total					348	11	113	3	66,645	1,744	28,975	550

* Includes cases admitted for Anti-rabic treatment.

TABLE II.

SHOWS ADMISSIONS AND DEATHS IN HOSPITALS DURING 1936.

	EUROPEANS.			NON-EUROPEANS.		
	Adm.	Died	%	Adm.	Died.	%
Blue Nile Province :—						
Wad Medani	41	—	—	4,837	227	4.69
Wad Medani prison ...	—	—	—	434	1	0.23
Abu Usher	—	—	—	1,885	93	4.94
Sennar	—	—	—	1,650	38	2.30
Singa	1	—	—	1,113	68	6.11
Roseires	—	—	—	936	22	2.35
Kurmuk	—	—	—	374	4	1.07
Province dispensaries ...	—	—	—	147	1	0.68
Darfur Province :—						
Fasher	—	—	—	1,899	87	4.58
Geneina	—	—	—	1,585	36	2.27
Nyala	—	—	—	554	29	5.23
Zalingei	—	—	—	743	30	4.03
Province dispensaries ...	—	—	—	5,401	14	0.26
Equatorial Province :—						
Juba	12	—	—	3,044	27	0.88
Yei... ..	—	—	—	592	8	1.35
Torit	—	—	—	1,034	13	1.25
Kapoeta	—	—	—	795	11	1.38
Li Rangu	—	—	—	1,146	36	3.14
Meridi	—	—	—	1,457	13	0.89
Source Yubu	—	—	—	987	13	1.32
Wau	—	—	—	2,631	37	1.40
Rumbek	—	—	—	1,197	47	3.92
Aweil	—	—	—	698	2	0.28
Raga	—	—	—	653	8	1.22
Province dispensaries ...	—	—	—	10,724	114	0.06
Kassala Province :—						
Kassala	2	—	—	2,410	158	6.55
Gedaref	—	—	—	1,646	43	2.61
Port Sudan	121	6	4.96	2,183	74	3.39
Port Sudan prison ...	—	—	—	59	9	15.25
Suakin	—	—	—	70	2	2.85
Suakin quarantine ...	—	—	—	111	6	5.40
Province dispensaries ...	—	—	—	955	10	1.04
Khartoum Province :—						
Khartoum	190	4	2.10	3,014	196	6.50
Omdurman	—	—	—	2,126	101	4.74
Khartoum North ...	—	—	—	958	26	2.71
River Hospital	8	—	—	1,645	13	0.78
Jebel Aulia	11	—	—	1,178	25	2.12

TABLE II—(Continued).

	EUROPEAN.			NON-EUROPEANS		
	Adm.	Died	%	Adm.	Died.	%
Kordofan Province :—						
Obeid	7	—	—	2,247	138	6.14
Nahud	—	—	—	1,504	74	4.92
Kadugli	—	—	—	1,323	31	2.34
Dilling	—	—	—	1,113	16	1.44
Talodi	—	—	—	1,015	19	1.87
Province dispensaries ...	—	—	—	10,055	48	0.47
Northern Province :—						
Atbara	53	4	—	2,947	83	2.81
Shendi	—	—	—	943	16	1.69
Merowe	—	—	—	928	28	3.01
Dongola	—	—	—	943	14	1.48
Wadi Halfa	—	—	—	1,040	24	2.37
Province dispensaries ...	—	—	—	596	11	1.84
Upper Nile Province :—						
Malakal	15	—	—	3,621	70	1.93
Province dispensaries ...	—	—	—	2,083	—	—
White Nile Province :—						
Dueim	—	—	—	921	40	4.34
Kosti	—	—	—	1,470	40	2.72
TOTAL						
	461	14	9.93	95,620	2,294	2.39

GRAND TOTAL ... 96,081 admissions, with 2,308 deaths.

TABLE III.
VACCINATIONS PERFORMED DURING THE YEAR 1936.

PROVINCE.	PRIMARY.			RE-VACCINATION.			TOTAL.
	Success.	Failed.	Unknown	Success.	Failed.	Unknown	
Blue Nile	15,281	14,814	2,773	—	—	—	32,868
Darfur ...	1,647	109	44	—	—	—	1,800
Equatorial	101	397	5,406	—	—	—	5,904
Kassala ...	8,259	5,393	4,006	2,740	3,886	3,907	28,191
Khartoum	2,337	683	1,059	—	—	—	4,079
Kordofan ...	260	370	726	—	15	—	1,371
Northern ...	9,749	4,849	2,924	—	—	—	17,522
Upper Nile	150	80	120	90	39	—	479
White Nile	429	234	72	—	—	—	735
TOTAL ...	38,213	26,929	17,130	2,830	3,940	3,907	92,949

TABLE IV.

SHOWS IN-PATIENTS, OUT-PATIENTS, ENDEMIC DISEASES AND OPERATIONS DURING 1935 AND 1936.

PROVINCE.	Hospi- Dispen- tals saries		In-patients.		Out-patients.		Bilharziasis.		Trachoma.		Ancyl- ostomiasis.		Malaria.		Syphilis and Yaws.		Operations.	
	1935	1936	1935	1936	1935	1936	1935	1936	1935	1936	1935	1936	1935	1936	1935	1936	1935	1936
Blue Nile	5	73	10,235	11,418	942,705	1,026,551	998	1,630	30,309	34,890	445	42	57,052	62,745	6,398	6,173	1,490	1,557
Darfur	3	21	8,956	10,182	274,060	257,164	634	828	4,852	6,706	38	48	2,571	2,240	10,449	9,929	721	737
Equatorial	9	73	25,615	24,970	995,705	1,006,270	412	610	929	972	1,503	2,008	4,797	5,093	9,704	8,592	2,257	2,028
Kassala	5	38	6,388	7,557	502,570	527,329	105	72	27,407	30,855	14	195	15,997	22,996	6,284	8,125	1,495	1,487
Khartoum	5	17	8,607	9,130	723,087	705,477	552	466	59,024	58,563	280	102	2,316	4,370	3,170	1,818	2,001	2,073
Kordofan	5	33	15,185	17,264	765,655	800,663	1,985	2,147	6,252	7,290	105	36	18,236	20,982	21,248	23,212	1,353	1,292
Northern Prov.	5	46	7,226	7,450	1,419,271	1,649,598	3,734	4,096	104,563	112,235	473	427	33,803	49,125	3,858	3,490	1,110	1,150
Upper Nile	1	21	6,412	5,719	223,476	211,455	29	26	2,273	4,039	71	30	8,187	8,150	17,577	10,284	405	577
White Nile	2	15	1,830	2,391	265,714	316,334	736	983	11,026	12,465	11	59	7,941	14,042	5,147	5,948	312	328
TOTALS	40	337	89,083	96,081	6,112,303	6,500,441	9,185	10,858	246,635	268,015	2,970	2,947	150,900	189,713	83,835	77,571	11,124	11,229

TABLE V.

LIST SHOWING HOSPITALS AND DISPENSARIES 1936.

Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped
Blue Nile Province.		Blue Nile—Contd.		Equatorial Province—Ctd.	
Wad Medani	256	Um Degarsi	—	Ibba	—
Abu Usher	150	Wad El Ataia	—	Ikotos	29
Sennar	127	Wad El Bur	—	Kadiba	—
Singa	100	Wad Hussein	33	Kajo-Kaji	62
Roseires	100	Wad Medani Prison	—	Karajok	4
Abdel Galil	—	Wad Naaman	—	Karba	—
Abdel Hakam	—	Wad Rawa	—	Kashwal	—
Abdel Rahman	—	Wad Saadalla	—	Koggi	5
Abu El Hassan	—	Wad Sulfab	8	Kuru	—
Abu Hashim	—	Wisko	—	Kwajok	—
Abu Tiga	—			Kyala	14
Amara Kassir	—			Lafone	10
Attib	—	Darfur Province.		Lanyi	—
Bardana	—	El Fasher ...	138	Larumba	—
Bikeri	—	Geneina ...	35	Lau	—
Dar Agil	—	Nyala ...	48	Lita	6
Debeiba	—	Abu Matarig ...	—	Loa	4
Dolga	—	Buram ...	—	Loka	6
Efeina	—	Dar Maasalit	—	Luel	—
El Sukli	—	Travelling Disp. ...	—	Lui	—
Fahal	—	Deleig ...	—	Lyria	10
Fahal	—	Garseila ...	—	Madol	—
Fawar	—	Geneina Town ...	—	Madrugi	—
Futais	—	Gorgor ...	—	Makapandu	—
Galgani	—	Id El Ghanam ...	—	Marial Bal	—
Gawada....	—	Kas ...	—	Meshra	—
Geissan	—	Kebkebia ...	1	Mideh	—
Ghubshan	—	Kubbum ...	—	Migida	—
Gondal	—	Kuttum ...	2	Ngindo	—
Gule	—	Meidob	—	Nyin Akok	—
Hag Abdalla	—	Mistiri	—	Opari	21
Hamad El Nil	—	Radoom ...	—	Olo	—
Hassa Heissa	—	Sirri	—	Pap	—
Hilalia	—	Taweisha	—	Piele	—
Hosh	—	Um Buru ...	—	Pongo	—
Istarihna	—	Um Keddada	—	Raga	15
Kab El Gidad	—	Wadaa ...	—	Rikita	—
Kamlin	—	Zalingei ...	18	Said Bundas	—
Karkoj	4			Shambe	40
Keteir	—	Equatorial Province.		Sopo	—
Kumor	—	Jbua	165	Taali	22
Kurmuk	5	Wau	204	Teitt	—
Kurmuk Travelling	—	Rumbek	108	Tembura	—
Dispensary	—	Li Rangu	130	Terrakekka	13
Laota	—	Source Yubo	80	Toinya	—
Launi	—	Yei	30	Toliang	5
Lokandi	—	Torit	56	Tonj	11
Managil	—	Kapoeta	53	Uniba	—
Mealig	—	Meridi	61	Wandi Kammonde	—
Medina	—	Auallual	—	Wandi Walla	—
M. ringan	—	Amadi	—	Wol Athiang	—
Messellamia	—	Atok-Tau	—	Wun Rog	—
Mizeigeila	—	Aweil	17	Wun Shwal	—
Mohammed Zein	—	Badagbo	—	Yambio	—
Nidiana	—	Bakiri	—	Yirrol	30
Ora	—	Bazango	—		
Radma	—	Beri	—	Kassala Province.	
Remeitab	—	Bilal	—	Kassala ...	153
Roseires Travelling	—	Dari	—	Port Sudan ...	120
Dispensary	—	Deim Zubeir	—	Gedaref (Civil) ...	70
Rufaa	—	Dika	—	Gedaref (Military) ...	26
Sabi Deleib	—	Falwall	—	Abu Deleig ...	2
Saoleil	—	Gangura	—	Akik ...	—
Seleima	—	Goderu and Kala	—	Aroma ...	4
Shabarga	—	Gogrial	—	Car Dispensary ...	—
Suada	—	Gorria	—	Derudeib ...	4
Tabat	—	Hiriwa	—	Digein ...	—
Tayiba	—	Hogbo	—	Doka ...	1
Tebub	—				
Turabi	—				

TABLE V.—*Ctd.*

Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped	Hospitals and Dispensaries	Beds. equipped
Kassala—<i>Contd.</i>		Kordofan Province—<i>Ctd.</i>		Northern Province—<i>Ctd.</i>	
Galaat El Nahl ...	3	Abu Gebeiha ...	10	Kareima	—
Gallabat ...	7	Abu Zabad ...	30	Khandak	—
Gebeit ...	13	Bara ...	22	Kitiab	2
Gebeit Mine ...	—	Delami ...	50	Korti ...	—
Gheit ...	—	El Buram ...	20	Mansurkotti ...	—
Goz Ragab ...	3	El Liri ...	20	Metemma	—
El Hog ...	—	El Odaya ...	10	Mograt Island ...	2
Hadalyia ...	—	Ernil ...	5	Monassir ...	2
Halenga ...	—	Gardud ...	10	Nuri ...	—
Hawata ...	2	Ghabeish ...	5	Shendi Town Disp. ...	—
Hillet Hokoma ...	—	Ghulfan ...	20	Shereik	2
Kassab ...	—	Hammadi ...	5	Suarda ...	—
Kassala Station ...	2	Heiban ...	20	Tayiba El Khawad ...	—
Khashm El Girba ...	2	Katla ...	20	Timeirab ...	—
Khatmia ...	—	Kau ...	10	Um Breika ...	4
Mefaza ...	—	Kauda ...	20	Wad Hamed ...	5
Mekali ...	—	Keilak ...	2	Zeidab ...	—
Metatib ...	—	Kilogi ...	10		
Musmar ...	2	Lagawa ...	12		
Northern Trav. D. ...	—	Muglad ...	19		
Oyo ...	—	Muglad Trav. Disp. ...	—	Upper Nile Province.	
Port Sudan Prison ...	13	Rahad ...	18	Malakal ...	371
Port Sudan East Side...	—	Rashad ...	20	Abwong ...	9
Shiwak ...	2	Shawai ...	10	Akobo ...	20
Shellag ...	—	Sherkeila ...	—	Bor ...	10
Sinkat ...	—	Soderi ...	6	Detwok ...	6
Southern Trav. D. ...	—	Sug El Gamal ...	5	Doleib Hill ...	—
Suakin ...	10	Tira Limon ...	5	Fungak ...	6
Suak'n Qurrantime ...	30	Um Barambeita ...	10	Gambeila ...	5
Tendelai ...	—	Um Dorein ...	20	Kaka ...	8
Tokar ...	18	Um Ruaba ...	50	Kodok ...	13
Um Bereiga ...	—			Kongor ...	8
		Northern Province.		Ler ...	—
		Atbara ...	154	Lul Mission ...	4
Khartoum Province.		Wadi Halfa ...	74	Melut ...	4
Khartoum ...	181	Shendi ...	71	Nasser ...	5
Khartoum North ...	35	Merowe ...	70	Pibor ...	—
Omdurman ...	160	Dongola ...	66	Renk ...	9
River Hospital ...	192	Abidia ...	—	Rom ...	—
Jebel Aulia ...	102	Abri ...	—	S.S. Kerreri ...	22
Ailafoun ...	—	Abu Hamad ...	6	S.S. Lady Baker ...	22
Burri ...	—	Akasha ...	—	Tonga ...	12
Deims ...	—	Aliab ...	—	Yoynyang Mission ...	6
Deim Saad ...	—	Atmour ...	2		
Geili ...	1	Attiri ...	—	White Nile Province.	
Gereif (East) ...	—	Argo ...	—	Dueim ...	52
Gereif (West) ...	—	Amentego ...	—	Kosti ...	47
Gordon's Tree ...	—	Badein ...	—	Abu Rukba ...	1
Gordon College ...	—	Berber ...	8	Dar El Ahanda ...	—
Kheleila ...	—	Bouga ...	4	Dar El Salam ...	1
Kartoum North Prison ...	37	Darmali ...	—	Fashishoya ...	—
Midwifery School ...	32	Debba ...	—	Gebelein ...	1
Murada ...	—	Delgo ...	—	Geteina ...	3
Omdurman Tech. Sch. ...	—	Dikka ...	—	Kawa ...	—
Seleitat ...	2	Dobeira ...	—	Maatuk ...	1
Serurab ...	—	El Damer ...	1	Naaima ...	1
Tuti ...	—	El Sir ...	—	Rahmania ...	2
Wad Nubawi ...	—	Eneibis ...	3	Shawal ...	—
		Fareig ...	—	Shigeig ...	1
Kordofan Province.		Gadalla ...	2	S.R. Car Disp. ...	—
El Obeid ...	112	Gandettu ...	2	Tendelti ...	—
Nahud ...	83	Ghaba ...	—	Turaa ...	1
Kadugli ...	100	Gureir ...	—		
Dilling ...	100	Haffir ...	—		
Talodi ...	100	Halfa Degeim ...	—		
Abbassia ...	20	Hilgi ...	—		
		Kabushia ...	—		
				Total Beds Equipped =	5,542

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